Offsite Vapor Intrusion Investigation Outboard Marine Corporation Plant 2, Waukegan, Illinois WA No. 105-RARA-0528, Contract No. EP-S5-06-01

PREPARED FOR:	Tim Drexler/USEPA
PREPARED BY:	Jennifer Simms/CH2M HILL
	Dave Shekoski/CH2M HILL
COPIES:	Jewelle Keiser/CH2M HILL
	Loren Lund/CH2M HILL
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Introduction

This memorandum summarizes the offsite vapor intrusion (VI) investigation conducted as part of the remedial action at the Outboard Marine Corporation, Inc. (OMC) Plant 2 Site in Waukegan, Illinois. The investigation was conducted on the adjacent Larsen Marine Services Inc. (Larsen) property, south of the site. There is a dissolved-phase chlorinated volatile organic compound (CVOC) groundwater plume extending from the site to the northern part of the Larsen property, which is hydraulically downgradient. An air sparge curtain was installed along the southern OMC Plant 2 boundary and has been operated since March 2011 to prevent the offsite migration of the plume. The buildings on the Larsen property serve the recreational boat industry ranging from storage, maintenance, and sales. The investigation was performed out of concern that the CVOCs volatilizing from the groundwater into soil gas could potentially be transported into the buildings through defects in the floor and foundation resulting in a complete inhalation exposure pathway to building occupants.

The VI study was conducted in two phases. Phase 1 was completed in April 2012 and included the installation of probes and sample collection in seven[1] buildings. Phase 2 was completed in April 2013 and included sampling from only buildings where potential VI concerns were identified in Phase 1. Combined sample locations from the Phase 1 and Phase 2 VI investigations are shown in Figure 1. The reports summarizing the Phase 1 and Phase 2 investigations are provided in Attachments 1 and 2, respectively.

Phase 1 Investigation

The planning of the VI investigation was initiated in February 2012 with a survey of each of the buildings on the Larsen property. Each building was inspected to gather information on characteristics pertinent to the VI pathway (such as such as use, occupancy, slab and building construction, potential indoor VOC sources, etc.) and to identify potential sampling locations. Phase 1 of the VI investigation was developed to: (1) determine if CVOCs are volatilizing from the OMC Plant 2 groundwater plume, a process that is being enhanced by the air sparge curtain, and accumulating in the subslab soil gas beneath the buildings on the Larsen property; and (2) evaluate the potential for site-related CVOCs detected in the subslab soil gas and/or crawl space air samples to impact indoor air quality above regulatory screening levels under current site conditions within the occupied buildings.

The memorandum *Offsite Vapor Intrusion Investigation* (CH2M HILL October 2011) provided in Attachment 1 summarizes the investigation and results of the first investigation.

[1] The seven individual buildings that were investigated are included in five contiguous structures.

Data Collection

The Phase 1 investigation was conducted between April 16 and 20, 2012, in accordance with the procedures outlined in the *Quality Assurance Project Plan (QAPP) Revision 1* (CH2M HILL 2012). The activities included installation and sampling of 22 subslab probes in 7 selected buildings and the collection of one crawl space sample from beneath the raised floor in the store/office portion of the Main Building. The subslab soil gas and crawl space air samples were collected using 6-liter Summa canisters equipped with flow controllers that were preset by the laboratory to collect the sample over an 8-hour period. The samples were submitted to Columbia Analytical Services in Simi Valley, California, for VOC analysis using U.S. Environmental Protection Agency (USEPA) Method TO-15.

Results and Recommendations

Three of the five VOCs that were measured in subslab soil gas or crawl space air at concentrations above screening levels are not chemicals of potential concern for the OMC Plant 2 site. The three chemicals are chloroform, dichloromethane (methylene chloride), and tetrachloroethylene (PCE). Additionally, the three VOCs were measured at concentrations at least one order of magnitude less than their respective generic VI groundwater screening levels. Dichloromethane was the only VOC with a concentration greater than the crawl-space screening level.

Two site-related CVOCs (trichloroethene [TCE] and cis-1,2-dichloroethene [cis-1,2-DCE]) were detected at concentrations above regulatory screening levels in subslab soil gas samples collected from Buildings B/C and L and the Main Building. The three subslab soil gas probes with measured concentrations of cis-1,2-DCE that exceeded the soil gas screening level (SGSL) are located in the central and southern parts of the Main Building. Measured concentrations of TCE exceeded the SGSL in 10 of the 22 subslab soil gas samples. The exceedances occurred in the Main Building (eight of nine probes), Building C (one of two probes), and Building L (one of two probes). The highest TCE concentration (940 micrograms per cubic meter) was observed in the southeast corner of Building L. It could not be ruled out, based on the results of the Phase 1 investigation, that TCE and cis-1,2-DCE above regulatory screening levels beneath Buildings B/C and L and the Main Building were related to volatilizing from the OMC Plant 2 shallow groundwater plume. There was also some uncertainty as to whether the degradation of PCE, a non-site-related VOC beneath the southern portion of the Main Building, is contributing to the TCE and cis-1,2-DCE concentrations in that area of the building.

The potential for the VI pathway to cause indoor air levels of site-related CVOCs to exceed regulatory screening levels at Buildings L, C/B, and the Main Building could not be ruled out. The soil gas screening levels used for the VI study are based on a default attenuation factor (AF) of 0.1 in accordance with the USEPA Region 5 *VI Guidebook* (2010). USEPA developed the default AF based on VI results from residential buildings. It is not likely to be representative of the large industrial/commercial-type buildings on the Larsen property. USEPA allows the option to collect data to support development of site-specific AFs. Therefore, further investigation of the VI pathway was recommended to determine if indoor air concentrations due to VI exceed regulatory target levels and to calculate building-specific attenuation factors.

The VI pathway is unlikely to cause indoor air levels of site-related VOCs to exceed regulatory screening levels in Buildings H, J, K, and the Spar Building because measured CVOC subslab soil gas concentrations were below the SGSLs. Therefore, further investigation of the VI pathway is not necessary at the buildings.

Phase 2 Investigation

The Phase 1 results were used to design the Phase 2 investigation of the VI pathway in Buildings C/B and L and the Main Building. The objectives of the Phase 2 investigation were to confirm the subslab soil gas concentrations measured in Phase 1; evaluate temporal variability of subslab soil gas VOC concentrations; calculate building-specific AFs using the tracer gas radon data; and determine if the VI pathway is complete or significant (that is, causing indoor air concentrations to exceed regulatory targets).

The memorandum *Phase 2 Offsite Vapor Intrusion Investigation* (CH2M HILL 2013) provided in Attachment 2 summarizes the investigation and results of the second investigation.

Data Collection

The Phase 2 investigation was conducted from April 8 to 15, 2013. The field activities included reinstallation of one subslab probe (SG-17) in the Main Building showroom area; collection of subslab soil gas, and crawl space and indoor air samples in Buildings B/C and L and the Main Building; and collection of two outdoor air samples near the three buildings. Subslab soil gas and crawl space, indoor, and outdoor air samples were collected in 6-liter Summa canisters over an 8-hour sampling period for VOC analysis by USEPA Method TO-15. Subslab soil gas and indoor and outdoor air samples were collected at a subset of the sampling locations over a 5-minute sampling period in 1-liter Tedlar bags for radon-222 analysis. The radon samples were collected to provide data to calculate empirical subslab soil-gas-to-indoor air AFs for each building.

Results and Recommendations

The USEPA risk-based screening levels for subslab soil gas, and indoor and crawl space air were calculated using the site-specific AF, which was, in turn, calculated using the measured concentrations of radon-222 in the subslab soil gas and indoor air samples. The site-specific AFs were calculated to be 0.001 to 0.002, indicating that more attenuation is occurring than the generic AF of 0.1 used to calculate the SGSLs in Phase 1.

No VOCs in soil gas were measured above the site-specific SGSLs in the Main Building or Buildings B/C or L during Phase 2. Although several VOCs (1,4-dichlorobenzene, ethylbenzene, m,p-xylenes, and PCE) were measured above the site-specific indoor air screening levels for mitigation in the three buildings, the multiple lines of evidence evaluation preformed strongly suggested that the presence of the compounds is likely due to indoor sources. Therefore, the VI pathway is not complete or significant at the Main Building, Buildings B/C, or L.

Conclusions

The Phase 1 investigation determined that the VI pathway is not complete or significant at Buildings H, J, K, and the Spar Building. The Phase 2 investigation found that the VI pathway is also not complete or significant at Buildings B/C, L, and the Main Building based on multiple lines of evidence evaluation under current conditions. Further evaluation of the VI pathway is not warranted.

Works Cited

CH2M HILL. 2011. *Offsite Vapor Intrusion Investigation.* October.

CH2M HILL. 2012. *Quality Assurance Project Plan (QAPP) Revision 1.*

CH2M HILL. 2013. *Phase 2 Offsite Vapor Intrusion Investigation.*

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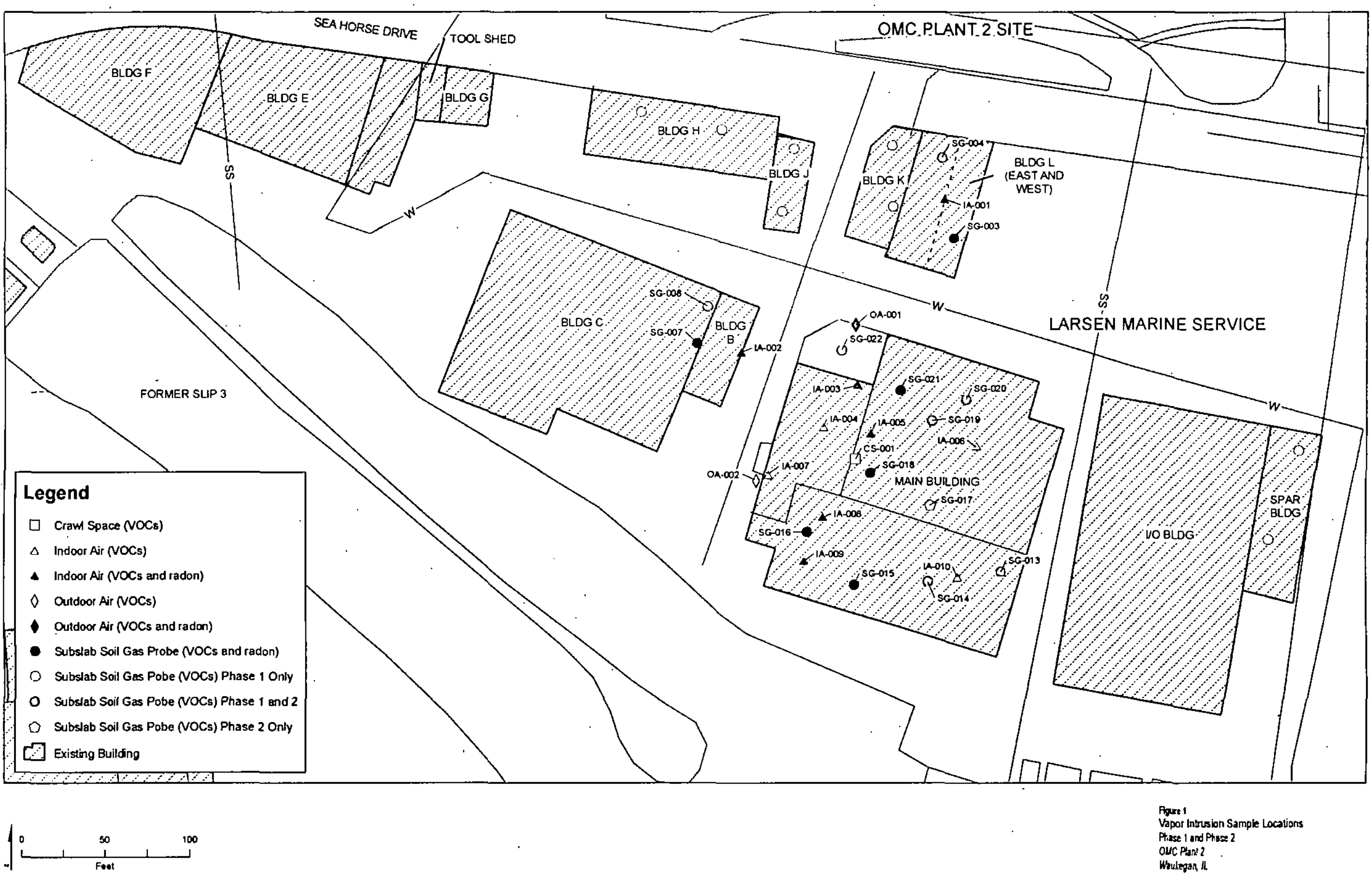

Figure 1
Vapor Intrusion Sample Locations
Phase 1 and Phase 2
OMC Plant 2
Waukegan, IL

E:\EPA\186305-OMC\GIS_DATA\MXDS\2013\PHASE1ANDPHASE2\FIGURE 01 - VAPOR INSTRUSION SAMPLE LOCATIONS.MXD JHANSEN1 8/19/2013 9:47:09 AM

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Attachment 1
Phase 1 Offsite Vapor Intrusion Investigation
OMC Plant 2 RA, Waukegan, Illinois

Offsite Vapor Intrusion Investigation OMC Plant 2 RA, Waukegan, Illinois WA No. 105-RARA-0528, Contract No. EP-S5-06-01

PREPARED FOR: Tim Drexler/USEPA

PREPARED BY: Jennifer Simms/CH2M HILL
Dave Shekoski/CH2M HILL

COPIES: Jewelle Keiser/CH2M HILL

DATE: October 1, 2012

Introduction

This technical memorandum presents the results of the vapor intrusion (VI) investigation conducted as part of the Outboard Marine Corporation, Inc. (OMC), Plant 2 (site) remedial action activities in Waukegan, Illinois (Figure 1). The investigation was conducted on the adjacent Larsen Marine Services Inc property, located south of the site. There is a dissolved-phase chlorinated volatile organic compound (CVOC) groundwater plume extending from the site to the northern portion of the Larsen Marine property, which is hydraulically downgradient. An air sparge curtain installed along the southern OMC Plant 2 boundary is currently being operated to prevent the offsite migration of the plume. There are multiple buildings on the Larsen Marine property used for serving the recreational boat industry ranging from storage, maintenance, sales, and service. The objectives of the VI investigation were to: (1) determine if CVOCs are volatilizing from the OMC Plant 2 groundwater plume, a process that is being enhanced by the air sparge curtain, and accumulating in the subslab soil gas beneath the buildings on the Larsen Marine property; and (2) evaluate the potential for site-related CVOCs detected in the subslab soil gas and/or crawl space air samples to impact indoor air quality above regulatory screening levels under current site conditions within the occupied buildings. Samples of subslab soil gas and crawl space air were collected from beneath five buildings in April 2012.

The VI investigation was performed in accordance with the *Quality Assurance Project Plan (QAPP) Revision 1* (CH2M HILL, 2012) and the following guidance documents:

- U.S. Environmental Protection Agency (USEPA) Region 5 *Vapor Intrusion Guidebook* (USEPA, 2010)
- USEPA Office of Solid Waste and Emergency Response *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (USEPA, 2002)
- Interstate Technology and Regulatory Council (ITRC) *Vapor Intrusion Pathway: A Practical Guideline* (ITRC, 2007a)
- *ITRC Vapor Intrusion Pathway: Investigative Approaches for Typical Scenarios* (ITRC, 2007b)

The above vapor intrusion guidance documents were given preference over the State of Illinois EPA Tiered Approach to Corrective Action Objectives because the OMC Plant 2 Site is a USEPA Superfund Site.

Site Background Information

OMC manufactured outboard motors from about 1948 until 2000 in the former 1,036,000-square-foot manufacturing building that has since been demolished and removed. OMC operated several vapor degreasers at the facility to clean newly made parts with trichloroethene (TCE). Leaking degreasers and/or TCE storage tanks have created a widespread CVOC groundwater plume and an isolated dense nonaqueous phase liquid (DNAPL) TCE pool beneath the site (Figure 1).

OMC declared bankruptcy in 2000 and ceased manufacturing operations in August 2001. The OMC Plant 2 property was abandoned and put up for sale by the Trustee during the bankruptcy proceedings. The City of Waukegan assumed the title to the property in December 30, 2005, and is responsible for maintaining the property.

A remedial investigation was performed in 2004 and 2005 and the findings are presented in the *Remedial Investigation Report* (CH2M HILL, 2006a). A feasibility study was performed in 2005 and 2006 and is summarized in the *Feasibility Study Report* (CH2M HILL, 2006b). The potential remedial alternatives were re-examined after pilot testing enhanced in situ bioremediation treatment in two of the TCE source areas and a bench-scale test of zero-valent iron for remediation of the TCE DNAPL as documented in the *Supplemental Feasibility Study Report* (CH2M HILL, 2008a). USEPA issued a proposed plan for the cleanup of TCE DNAPL and groundwater in August 2008 and a Record of Decision in February 2009. At the time of the VI investigation, two of the components of the groundwater remedy had been implemented, the in situ treatment of the TCE DNAPL using zero-valent iron and the installation and operation of air sparge curtain.

Preliminary Conceptual Site Model for the VI Pathway

There is a dissolved phase chlorinated VOC plume that has migrated hydraulically downgradient from the source areas towards the Larsen Marine property. The depth to groundwater at the site ranges between 1 and 7 feet, depending on the ground surface elevation. An air sparge curtain was installed along the southern property boundary (north of Seahorse Drive and the Larsen Marine property) to prevent offsite migration of the TCE plume; operation of the system began in March 2011.

The TCE in groundwater is degrading by anaerobic reductive dechlorination into break down products such as vinyl chloride and cis-1,2-dichloroethylene (cis-1,2-DCE) as discussed in the *Data Evaluation Summary Report* (CH2M HILL, 2008b). Volatilization of the CVOCs from groundwater into soil gas occurs at the top of the water table; this process is likely being enhanced by the air sparge curtain. CVOCs in soil gas may be transported vertically to the ground surface into outdoor air or laterally. The primary transport mechanism for soil gas is typically diffusion; however, the air sparge curtain is likely creating a zone of pressure driven soil gas flow. Additional factors that affect soil gas transport include soil type, ground cover, the presence of utility conduits that may act as preferential pathways, and meteorological conditions (such as barometric pressure). Shallow soils at the site consist of fill material that extends to between 2 and 12 feet below ground surface, a poorly graded sand or silty sand deposit beneath that extends to depths between 25 and 30 feet, followed by hard gray clay that forms the lower boundary of the unconfined aquifer. The vadose zone soils (that is, fill material and sand/silty sand) are fairly porous, which allows for soil gas transport. The ground cover at the site previously consisted of the large concrete slab from the demolished building and asphalt. The ground cover at the Larsen Marine property is primarily buildings and asphalt. Venting of soil gas from the ground surface into the atmosphere is impeded by impervious ground cover. Several large underground utilities run from Seahorse Drive to the Larsen Marine property (Figure 2) and have the potential to act as preferential pathways for soil gas transport.

The primary transport mechanism becomes advection in soil gas beneath and near buildings. Factors affecting transport of soil gas into the buildings include the condition of the slab, and differential pressure between the interior and subslab that depends on various building and metrological characteristics (for instance, the air handling system, openings in the building, building use, wind, temperature, barometric pressure). Once soil gas is transported into a building it is attenuated in large interior spaces or from outdoor air exchange. The Larsen Marine property contains a marine service business that includes sales, maintenance, repair, and storage services that are housed in a complex of buildings occupied by employees and customers. Building surveys of each of the Larsen Marine buildings were performed in February 2012 to gather information on building characteristics pertinent to the VI pathway. Owners of Larsen Marine provided access to and historical information on the buildings. The building survey information is provided in Attachment A.

Subslab soil gas and crawl space air sampling was performed in April 2012 to determine if site-related CVOCs are present beneath the occupied Larsen Marine buildings. CVOCs measured in subslab soil gas were compared to default VI risk-based screening levels to evaluate if there is a potential for those CVOCs to be present in indoor air at concentrations above regulatory screening levels under current site conditions.

Sampling Activities

The VI investigation field event took place from April 16 to 20, 2012. Utility clearance of the proposed subslab soil gas probe locations was performed on April 16, the probes were installed Monday through Wednesday (April 16 through 18), and sampling took place Thursday through Friday (April 19 through 20). Sampling was performed concurrently at each building or group of connected buildings (that is, all of the subslab soil gas samples at Buildings L and K were collected concurrently). The buildings were occupied and being used during the sampling period; the heating, ventilation, and air conditioning systems were operating at typical settings.

Sampling activities were performed in accordance with the procedures set forth in the *Quality Assurance Project Plan (QAPP) Revision 1* (CH2M HILL 2012). However, the sampling plan in the QAPP did not include crawl space air sampling, only subslab soil gas sampling. One crawl space air sample was collected in the Main Building due to the presence of a raised wooden floor above the concrete slab in the retail/office space. The crawl space air sample was collected from the void space between the slab and the raised floor because the slab could not be accessed to allow for subslab soil gas sampling and the air within the void space would contain vapors that may have migrated through the slab. Additional deviations from the procedures in the QAPP are described in the following paragraph and in the Sampling Methods section. The sampling locations are presented in Figure 3. Field sampling activities are presented in Tables 1 and 2.

The subslab soil gas and crawl space air samples were collected over an 8-hour sampling period in 6-liter SUMMA canisters for VOC analysis by USEPA Method TO-15. The sampling duration was based on the current 8-hour work schedule at Larsen Marine. However, the sample duration varied slightly due to differences in the calibration of the flow controllers received from the laboratory (Table 2). The variance did not impact the sampling results as the conditions within the buildings remained relatively constant throughout the workday.

Weather information during the sampling collection period from 8:00 a.m. on Thursday, April 19, to 6:00 p.m. on Friday, April 20, was obtained from Weather Underground's Website.[1] The temperature ranged from 41 to 45 degrees Fahrenheit (°F) and the barometric pressure ranged from 29.71 to 30.05 inches of mercury (Hg). It was very windy throughout the sampling event. On Thursday the wind speed was sustained around 20 miles per hour (mph) with gusts up to 35 mph. On Friday the wind speed ranged from 10 to 30 mph with gusts up to 45 mph. On both days the winds were from the north. There was no precipitation on Thursday or Friday.

Sample Locations

With the exception of Building H, unoccupied boat storage buildings were not included in the investigation. Subslab soil gas samples were collected from unoccupied cold boat storage Building H because it is located immediately across Sea Horse Drive from the air sparge curtain and is between the site and another occupied building (Building B). Subslab soil gas probes could not be placed in Building B because of the heated floor system in the slab, so probes were instead placed in Building C along the wall with Building B. There is one occupied building that was not included—the mobile home located south of the new boat storage building (Figure 1), which is the onsite residence for one full-time security personnel. The mobile home was excluded because significant VI impacts are not expected for the following reasons: (1) the mobile home sits on a new 18-inch-thick concrete slab and has a passively vented crawl space beneath the trailer; and (2) the mobile home is the farthest building on the Larsen property from the site's air sparge curtain.

Proposed sampling locations were selected in each of the seven selected buildings during the building survey, and were finalized with Larsen management on April 16. The sampling locations are presented in Figure 2. The locations are plotted on the figure based on hand measurements taken with a tape measure. The number and type of samples are detailed by building in Table 1. The sampling locations were selected to provide spatial coverage of each building, with some bias toward the site. Subslab soil gas probe locations were at least 5 feet away from exterior walls and in areas where the floor covering permitted probe installation (for example, not in carpeted areas).

[1] http://www.wunderground.com/.

Sampling Methods

Subslab Soil Gas Probe Installation and Sampling. Blood Hound Underground Utility Locators of Brownsburg, Indiana performed a utility clearance of the proposed subslab soil gas probe locations using a concrete scanner (handheld ground penetrating radar) and electronic utility locating equipment on April 16. Subsurface utilities, rebar, and wire mesh in the vicinity of the proposed locations were identified and marked. Twenty-two subslab soil gas probes consisting of stainless steel Swagelok parts were installed from April 16 to 18 using a hammer drill with concrete masonry drill bits.

Installation of subslab soil gas probes consisted of drilling a 1-inch-diameter recess hole in the slab surface (large enough to allow the end nut to be secured with a wrench and deep enough for it to be flush with the floor) and a 0.5-inch-diameter hole through the remainder of the slab. The 0.5-inch-diameter hole was drilled at least 3 inches below the bottom of the slab into the subslab bedding material to create a void space and ensure that soil and/or sand was not pulled into the probe. The thickness of the slab and total hole depth were then measured.

Each subslab probe, consisting of stainless steel Swagelok parts (tubing attached to a probe union with a nut and ferrule) and a brass cap, was assembled and trimmed so that the probe would not extend below the bottom of the slab. The probe was inserted into the hole and sealed with Portland cement; the cement was allowed to harden for at least 24 hours.

Purging and leak checking of the subslab soil gas probes with helium began on Wednesday, April 18. Purging was done by drawing at least 0.5 liter of soil gas from the probe with a vacuum pump at a rate of about 200 milliliters per minute. Leak checking was performed by covering the probe with a vessel filled with helium while drawing soil gas from the probe and into a Tedlar bag. The contents of the bag were then checked for helium with a Dielectric MGD Helium Detector, and if the helium concentration was less than 1,000 parts per million (0.1 percent) the probe passed the leak check. If a leak was found, the seal was either repaired with Portland cement or the probe was replaced, based on a visual assessment of the probable cause of the failure. Initial leak checking continued through Thursday, April 19, and leak checking of repaired or replaced probes was completed on Friday, April 20. There was one subslab probe (SG-017 in the main building showroom) that was abandoned after it failed the leak check, was repaired/replaced, and then failed the leak check again. All other probes passed the leak testing procedures.

Sampling of the subslab soil gas probes was conducted Wednesday through Friday (April 18 through 20). The samples were collected in 6-liter SUMMA canisters equipped with flow controllers that were set by the laboratory to collect the sample over an 8-hour period. The initial and final canister pressures were measured with a digital vacuum gauge provided by the laboratory. The canister's initial vacuum had to be greater than -28 inches Hg to be used for sampling; canisters with less vacuum were returned unused to the laboratory. The canister vacuum during sample collection was observed from dedicated analog gauges. Periodic vacuum checks are made to assure that soil gas was actually being drawn into the canister. The canisters were attached to the probes with Teflon tubing and Swagelok nuts. Final canister vacuums between -2 and -5 inches Hg were targeted to collect as much sample volume as possible while still leaving some residual vacuum that the laboratory could confirm upon receipt. When the sampling period was completed the canister valve was closed, the canister was detached from the probe, and the probe cap was replaced. The subslab soil gas probe installation and sampling information recorded in the field are presented in Tables 1 and 2.

Crawl Space Air Sampling. One crawl space air sample was collected from the void space beneath the raised floor in the retail/office space in the Main Building on Friday, April 20. The crawl space was accessed through metal plate covering an abandoned electric outlet. The plate was removed and Teflon tubing was extended into the crawl space. The hole was then covered with paper taped to the floor to prevent exchange between the crawl space and indoor air during sampling. The tubing was attached to a canister with a Swagelok nut for sample collection. The crawl space air sample was collected concurrently with the subslab soil gas samples at the Main Building.

The crawl space air sample was collected in a 6-liter SUMMA canister equipped with flow controllers that were set by the laboratory to collect the sample over an 8-hour period. Crawl space air sample procedures were similar to those for subslab soil gas sampling (the initial and final canister vacuums were measured with a digital vacuum gauge, an analog gauge was used to monitor the vacuum during sampling, and the same requirements for initial and final vacuums were used). When the sampling period was completed the canister valve was closed, the canister was detached from the tubing and the metal plate was replaced. The crawl space air sampling information recorded in the field is presented in Table 2.

Analytical Results

Columbia Analytical Services (CAS) in Simi Valley, California, performed the analyses for VOCs using USEPA Method TO-15. CAS supplied the canisters and flow controllers used for the sample collection. Analytical results from the subslab soil gas and crawl space air samples are presented in Tables 3 and 4; the laboratory's full TO-15 target analyte list was reported.

The project chemist performed a data usability evaluation (Attachment B). Duplicate samples were collected at a frequency of 10 percent (1 per 10 samples), and 3 duplicate subslab soil gas samples were collected. *Quality Assurance Project Plan (QAPP) Revision 1* (CH2M HILL, 2012a) describes the data quality evaluation procedures that address precision, accuracy, representativeness, completeness, and comparability parameters. The data usability evaluation indicates that the project goals for data precision and accuracy, as measured by field and laboratory quality control indicators, have been met and that analyte and method objectives for completeness were met (Attachment B).

Data Evaluation

Multiple lines of evidence were used to accomplish the following: (1) determine if CVOCs are volatilizing from the OMC Plant 2 groundwater plume and accumulating in the subslab soil gas beneath the buildings on the Larsen property; and (2) evaluate the potential for site-related CVOCs detected in the subslab soil gas and/or crawl space air samples to impact indoor air quality above regulatory screening levels within the occupied buildings and under current site conditions. The primary line of evidence was a comparison of analytical data to generic subslab-to-indoor air risk-based screening levels. Additional lines of evidence that were considered include the following:

- Comparison of detected VOCs in subslab soil gas and crawl space air results
- Comparison of detected VOCs in subslab soil gas and crawl space air to the known site-related VOCs
- Comparison of subslab soil gas and shallow groundwater VOC concentrations
- Spatial patterns of VOC concentrations
- Building characteristics pertinent to the VI pathway
- Potential indoor VOC sources

Recommendations for further actions (for instance, investigation, mitigation, or monitoring) were made in accordance with the decision rules described in Section 8 (Decision Making at Vapor Intrusion Sites) of the USEPA Region 5 *Vapor Intrusion Guidebook* (USEPA, 2010).

Data Comparison to USEPA Risk-based Screening Levels

The USEPA risk-based screening levels for subslab soil gas and crawl space air were calculated in accordance with the USEPA Region 5 *Vapor Intrusion Guidebook* and the methods used by the USEPA VI Screening Level Calculator Version 2.0 (USEPA, 2012a) released in May 2012, and use USEPA regional screening levels (RSLs) for air (USEPA, 2012b). The industrial air RSLs were used because the buildings on the Larsen Marine property are currently being used for commercial purposes. RSLs are not provided for several VOCs, and RSLs for similar VOCs were used as surrogates when appropriate.

The soil gas screening levels (SGSLs) for further investigation (that is, concurrent indoor air and sub-slab soil vapor sampling) correspond to an excess lifetime cancer risk (ELCR) of 10^{-6} or hazard index (HI) of 0.1 and are based on the USEPA Region 5 generic default shallow-soil-gas-to-indoor-air attenuation factor (AF) of 0.1. The crawl space screening levels (CSSLs) for further investigation (that is, concurrent indoor and crawl space air sampling) correspond to an ELCR of 10^{-5} or HI of 1 in indoor air, assuming the USEPA Region 5 generic default crawl-space-air-to-indoor-air attenuation factor of 1 (USEPA, 2010).

Table 3 presents comparison of the subslab soil gas analytical results to the SGSLs. Four VOCs were measured at concentrations in one or more subslab soil gas samples with concentrations that were greater than the SGSLs—chloroform, cis-1,2-DCE, tetrachloroethlyene (PCE), and TCE. Table 4 presents a comparison of the crawl space air analytical results to the CSSLs. Dichloromethane was the only VOC with a concentration greater than the CSSL. Analytical results for the detected compounds are presented on Figure 3.

Multiple Lines of Evidence Evaluation

The following observations were made during an evaluation of the multiple lines of evidence:

- Three of the five VOCs that were measured in subslab soil gas or crawl space air at concentrations above screening levels have not been identified as chemicals of potential concern for the site in the remedial investigation (CH2M HILL, 2006a); chloroform, dichloromethane, and PCE. Additionally, the three VOCs were measured at concentrations at least one order of magnitude less than their respective generic VI groundwater screening levels obtained from the USEPA VI Screening Level Calculator Version 2.0 (USEPA, 2012a) in shallow groundwater south of the air sparge curtain since 2005. The following are probable explanations for the presence of the VOCs in the samples:
  - Chloroform was measured at concentrations above its SGSL in eight of the subslab probes: six in the Main building, one in Building C, and one in Building L. The concentrations of chloroform in subslab soil gas samples may be related to subsurface water and sewer utilities; chloroform is a chlorine disinfection byproduct that off-gases from treated potable water (Agency for Toxic Substances and Disease Registry [ATSDR], 1997).
  - Dichloromethane (otherwise known as methylene chloride) was measured at a concentration above the CSSL in the crawl space air sample from the Main Building. However, the presence of dichloromethane in the crawl space air sample is likely related to an indoor source based on the reported concentrations in nearby (SG-018) and other subslab soil gas samples from the same building (that is, reported concentrations in subslab soil gas samples were at least six times lower). Dichloromethane is used as a paint stripper and in aerosol products (ATSDR, 2011), both of which may have been either used in the boat repair shop or sold in the retail store located in the Main Building.
  - PCE was measured at concentrations above its SGSL in two of the nine subslab soil gas samples from the Main Building. The sample locations were in the shop area in the southwest corner of the building (farthest from the air sparge curtain). PCE has historically been used for metal degreasing (ATSDR, 2011) and such products may have been used historically in the shop.
- There were two site-related VOCs measured in subslab soil gas at concentrations exceeding their respective SGSLs (cis-1,2-DCE and TCE) (Table 3 and Figure 3). The three subslab soil gas probes with measured concentrations of cis-1,2-DCE that exceeded the SGSL are located in the central and southern parts of the Main Building. The measured concentrations of TCE exceeded the SGSL in 10 of the 22 subslab soil gas samples. The exceedances occurred in the Main Building (eight of nine probes), Building C (one of two probes), and Building L (one of two probes). The highest TCE concentration (940 micrograms per cubic meter [$\mu g/m^3$]) was observed in the southeast corner of Building L.
  - The spatial distribution of cis-1,2-DCE and TCE in subslab soil gas does not provide a clear indication of influence from the air sparge system (that is, the highest measured concentrations would be closest to the air sparge curtain with decreasing concentrations with distance away from the curtain). However, influence from the air sparging cannot be ruled out.
  - The presence of TCE and cis-1,2-DCE in subslab soil gas may be the result of volatilization from the groundwater beneath the buildings (that is, not related to the air sparging). However, correlation between measured concentrations in soil gas and shallow groundwater is unclear due to the lack of shallow groundwater data in the vicinity of the Larsen Marine buildings (Figures 2 and 3). The measured concentrations of cis-1,2-DCE do not appear to correlate with the location of the shallow groundwater plume (subslab soil gas concentrations are highest closest to the plume and decreasing with distance).

The location of the shallow groundwater TCE plume does appear to correlate with the measured subslab soil gas TCE concentrations in Building L and the northern part of the Main Building.

- Elevated concentrations (ranging from 86 to 400 $\mu g/m^3$) of a non-site-related VOC—PCE, which is a parent compound of both TCE and cis-1,2-DCE—were measured in the central and southern parts of the Main Building. It is possible that the presence of TCE and cis-1,2-DCE in subslab soil gas in this area of the Main Building is the result of degradation of PCE.
- There is no indication from the subslab soil gas data that underground utilities on the Larsen property are acting as preferential pathways for soil gas transport.

- The SGSLs for further investigation were based on a default AF of 0.1 in accordance with the USEPA Region 5 *Vapor Intrusion Guidebook* (USEPA, 2010). However, the default AF is based on data collected from residential buildings and may overestimate actual indoor air concentrations in commercial/industrial-type buildings like the Larsen Marine buildings. The following building characteristics of the Main Building and Buildings L and C/B (in other words, where measured subslab soil gas concentrations were above SGSLs) indicate that empirical may be lower at the respective buildings:
  - Large interior compartments allowing for dilution of any subslab soil gases entering the building. Buildings L and B have 20-foot high ceilings. Building B has no interior dividing walls, and the one wall in Building L has two openings without doors. The Main Building consists mostly of several large interior compartments, including the showroom and shop areas; although the office and retail space in divided into smaller rooms, the doors to the rooms are usually kept open.
  - Thick concrete slabs that are generally in good condition. The slab thickness ranged from 5 to 12 inches in the Main Building, 5.5 to 9.5 inches in Building C, and 5 to 7 inches in Building L. Although some cracks were observed in each building, it is unknown if the cracks extend through the entire slabs. The majority of the slab surfaces are in good condition.
- The measured concentrations of VOCs in subslab soil gas samples collected from Buildings H, J, K, and the Spar Building did not exceed SGSLs.

Conclusions

It is not possible to rule out that the elevated (above regulatory screening levels) TCE and cis-1,2-DCE subslab concentrations beneath Buildings B/C and L and the Main Building are related to volatilizing from the OMC Plant 2 shallow groundwater plume. However, it could not be determined to what extent, if any, the air sparge curtain is influencing this process because the subslab soil gas sampling results do not provide a clear indication of effects from the system (that is, the highest measured concentrations at those buildings and probes closest to the air sparge curtain). There is also some uncertainty as to whether the degradation of PCE, a non-site-related CVOC beneath the southern portion of the Main Building, is contributing to the measured TCE and cis-1,2-DCE concentrations in that area of the building.

The potential for the VI pathway to cause indoor air levels of site-related CVOCs to exceed regulatory screening levels cannot be ruled out at Buildings L, C/B, and the Main Building because there were site-related CVOC concentrations reported in the subslab soil gas samples above the SGSLs for further investigation. There is some uncertainty about the representativeness of the SGSLs because they are based on a default AF of 0.1, which was developed based on VI results from residential buildings. USEPA's Region 5 *Vapor Intrusion Guidebook* (USEPA, 2010) allows the option to collect data to support development of site-specific AFs. Therefore, further investigation of the VI pathway should be performed at the buildings to determine if indoor air concentrations exceed regulatory target levels and calculate building-specific AFs.

The VI pathway is unlikely to cause indoor air levels of site-related VOCs to exceed regulatory screening levels in Buildings H, J, K, and the Spar Building because measured CVOC subslab soil gas concentrations were below the SGSLs. Therefore, further investigation of the VI pathway is not necessary at the buildings.

Recommendations for Further Actions

Additional investigation of the VI pathway should be conducted in Buildings C/B and L and the Main Building. The proposed investigation should include concurrent sampling of the subslab soil gas and indoor/outdoor air to accomplish the following: (1) confirm the April 2012 measured subslab soil gas concentrations; (2) evaluate the potential for temporal variability of subslab soil gas VOC concentrations; (3) calculate building-specific AFs (using VOCs, if feasible, and a tracer gas such as radon); and (4) determine if the VI pathway is complete and/or significant (that is, causing indoor air VOC concentrations above regulatory target levels in occupied buildings). According to the USEPA Region 5 *Vapor Intrusion Guidebook* (USEPA, 2010), the additional sampling event should be performed in the "heating season" (the winter months from November to March when heating system will be in use) because the heating season is when indoor air CVOC concentrations resulting from the VI pathway are theoretically higher because of the heating, ventilation, and air conditioning system operation and building occupants keeping doors and windows closed.

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Attachments

A Larsen Building Descriptions

B Vapor Intrusion Data Quality Evaluation

Tables

TABLE 1
Subslab Soil Gas Probe Installation Log—April 2012
Larsen Marine Services Facility
Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

			Probe Installation				Purge and Leak Check					
Building ID	Sample Location / ID	Location Description	Install Date	Install Time	Slab Depth (inches)	Probe Depth (inches)	Purge Date	Purge Start Time	Purge Rate (mL/min)	Purge End Time	Helium Leak Check (ppm)[a]	Total VOCs in Purge Gas (ppm)
Bulding H	SG-001	West Side of Building	4/16/2012	10:45	8	7.5	4/18/2012	10:15	200	10:20	0 (pass)	3.4
Bulding H	SG-002	East Side of Building	4/16/2012	11:30	7.5	7	4/18/2012	11:40	200	11:43	625 (pass)	4.7
Building L	SG-003	Southeast Side of Building	4/16/2012	16:20	7	6.5	4/18/2012	12:29	200	12:32	0 (pass)	3.8
Building L	SG-004	Northwest Side of Building	4/16/2012	15:00	5	4.5	4/18/2012	14:14	200	14:17	0 (pass)	7.5
Building K	SG-005	North Side of Building	4/16/2012	14:40	5	4.5	4/18/2012	14:34	200	14:38	0 (pass)	7.8
Building K	SG-006	Southeast Side of Building	4/16/2012	14:00	5	4.5	4/18/2012	15:22	200	15:25	0 (pass)	6.7
Building C	SG-007	South Probe Along West Wall	4/16/2012	17:10	9.5	9	4/18/2012	16:05	200	16:08	0 (pass)	6.2
Building C	SG-008	North Probe Along West Wall	4/16/2012	17:30	5.5	5	4/18/2012	16:27	200	16:30	0 (pass)	6.5
Building J	SG-009	South Side of Building	4/16/2012	15:30	8	7.5	04/19/12	8:31	200	8:34	0 (pass)	2.9
Building J	SG-010	North Side of Building	4/16/2012	16:00	6.5	6	04/19/12	9:01	200	9:04	0 (pass)	5.7
Spar Building	SG-011	Spar Building South Probe	4/18/2012	9:30	9	8.5	4/19/2012	11:11	200	11:14	7100 (fail)	n/a
			4/19/2012 Repaired	n/a			4/20/2012	9:20	0:00	9:23	1550 (pass)	1.1
Spar Building	SG-012	Spar Building North Probe	4/18/2012	9:05	4	3.5	4/19/2012	9:54	200	9:57	2475 (fail)	2.5
			4/19/2012 Re-install	10:45			4/20/2012	9:07	200	9:10	150 (pass)	0.6
Main Building	SG-013	Shop Area, East Side	4/17/2012	15:35	7.5	7	4/19/2012	15:36	200	15:39	0 (pass)	4.7
Main Building	SG-014	Shop Area, Center Location	4/17/2012	15:55	8	7.5	4/19/2012	16:11	200	16:14	0 (pass)	6.5
Main Building	SG-015	Boat Painting Area	4/17/2012	16:30	7	6.25	4/19/2012	16:28	200	16:31	0 (pass)	5.8
Main Building	SG-016	Shop Area, Northwest Side	4/17/2012	17:00	12	11	4/19/2012	16:50	200	16:53	0 (pass)	4.6

TABLE 1
Subslab Soil Gas Probe Installation Log—April 2012
Larsen Marine Services Facility
Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

			Probe Installation				Purge and Leak Check					
Building ID	Sample Location / ID	Location Description	Install Date	Install Time	Slab Depth (inches)	Probe Depth (inches)	Purge Date	Purge Start Time	Purge Rate (mL/min)	Purge End Time	Helium Leak Check (ppm)[a]	Total VOCs in Purge Gas (ppm)
Main Building	SG-017[b]	Showroom, South Wall of Showroom	4/17/2012	14:50	12	11	4/19/2012	13:20	200	13:23	80,000 (fail)	5.4
		Showroom, South Wall of Showroom (Repaired)	4/20/2012				4/20/2012	8:41	200	8:44	110,000 (fail)	-
Main Building	SG-018	Showroom, Southwest Corner Near Shop Door	4/17/2012	15:20	11	10	4/19/2012	14:11	200	14:14	0 (pass)	5
Main Building	SG-019	Showroom, Northwest Location, Near Office	4/17/2012	10:00	11.5	10.5	4/19/2012	14:29	200	14:32	0 (pass)	7.1
Main Building	SG-020	Showroom Northeast Location Display Area	4/17/2012	14:30	8.5	8	4/19/2012	14:44	200	14:47	0 (pass)	6.1
Main Building	SG-021	Office Area	4/17/2012	9:25	5	4.5	4/19/2012	11:53	200	11:56	675 (pass)	3.5
Main Building	SG-022	Retail Area Under Stairway	4/17/2012	9:00	6	5.5	4/19/2012	15:14	200	15:17	0 (pass)	6.1

Note:
[a] The subslab soil gas probe passes the helium leak check if the detected helium concentration is less than 1,000 parts per million (0.1 percent).
[b] SG-017 was abandoned for this round because of the failure to pass the leak check. (Probe seal was visually free of defects.)

Definitions:
mL/min = milliliters per minute
ppm = parts per million
VOC = volatile organic compound

TABLE 2
Subslab Soil Gas and Crawl Space Air Sampling Log—April 2012
Larsen Marine Services Facility
Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

		TO-15 (Summa Canister) Sampling										
Building ID	**Sample Location / ID**	**Sample ID**	**Canister ID**	**Pressure Gauge ID**	**Flow Controller ID**	**Flow Controller Rate**	**Sample Start Date**	**Sample Start Time**	**Initial Pressure—Digital ("Hg)**	**Sample End Time**	**Final Pressure—Digital ("Hg)**	**Sample Duration (HR:MIN)**
Bulding H	SG-001	OMC-SG001	SC01475	AVG00521	FCS00046	8-hour	4/19/2012	8:09	-28.8	17:34	-4.2	9:25
Bulding H	SG-002	OMC-SG002	SC00590	AVG01956	FCS00087	8-hour	4/19/2012	8:10	-28.6	17:40	-3.6	9:30
Building L	SG-003	OMC-SG003	SC00932	AVG01459	FC00023	8-hour	4/19/2012	8:14	-28.6	17:50	-1.9	9:36
Building L	SG-004	OMC-SG004	SC00206	AVG02082	FCS00003	8-hour	4/19/2012	8:15	-28.6	18:08	-2.7	9:53
Building K	SG-005	OMC-SG005	SC01093	AVG01181	FCS00017	8-hour	4/19/2012	8:17	-28.6	17:58	-2.8	9:41
Building K	SG-006	OMC-SG006	SC00971	AVG01428	FCS00024	8-hour	4/19/2012	8:20	-28.6	18:03	-10.8	9:43
Building C	SG-007	OMC-SG007	SC00195	AVG00594	FCS00072	8-hour	4/19/2012	8:25	-28.7	18:15	-3.9	9:50
Building C	SG-008	OMC-SG008	SC01595	AVG00513	FCS00078	8-hour	4/19/2012	8:27	-28.7	18:19	-2.5	9:52
Building J	SG-009	OMC-SG009	SC00205	AVG00204	FCS00002	8-hour	4/19/2012	9:30	-29.3	18:33	-4.1	9:03
Building J	SG-010	OMC-SG010	SC01483	AVG01059	FCS00036	8-hour	4/19/2012	9:24	29.1	18:27	-4.8	9:03
	Duplicate of SG-10	OMC-SG023-R	SC01015	AVG01106	FCS00065				29.1		-3.2	
Spar Building	SG-011	OMC-SG011	SC000846	AVG01413	FCS00106	8-hour	4/20/2012	9:56	-29.4	18:03	-5.2	8:07
Spar Building	SG-012	OMC-SG012	SC00638	AVG01350	FCS00051	8-hour	4/20/2012	9:50	-29.5	17:56	-5.5	8:06
	Duplicate of SG-012	OMC-SG025-R	SC00271	AVG00477	FSC00084				-29.4		-5.4	
Main Building	SG-013	OMC-SG013	SC00933	AVG01779	FSC00022	8-hour	4/20/2012	7:52	-28.2	16:37	-3.6	8:45
Main Building	SG-014	OMC-SG014	SC00471	AVG01031	FCS00086	8-hour	4/20/2012	7:53	-28.9	16:41	-7.9	8:48
Main Building	SG-015	OMC-SG015	SC00289	AVG01805	FCS00079	8-hour	4/20/2012	7:54	-28.5	16:45	-2.7	8:51

TABLE 2
Subslab Soil Gas and Crawl Space Air Sampling Log—April 2012
Larsen Marine Services Facility
Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

		TO-15 (Summa Canister) Sampling											
Building ID	Sample Location / ID	Sample ID	Canister ID	Pressure Gauge ID	Flow Controller ID	Flow Controller Rate	Sample Start Date	Sample Start Time	Initial Pressure—Digital ("Hg)	Sample End Time	Final Pressure—Digital ("Hg)	Sample Duration (HR:MIN)
Main Building	SG-016	OMC-SG016	SC00051	AVG01666	FCS00081	8-hour	4/20/2012	7:55	-28.9	16:51	-9.5	8:56
Main Building	SG-018	OMC-SG018	SC00675	AVG00639	FCS00076	8-hour	4/20/2012	7:50	-29.2	16:33	-9.7	8:43
Main Building	SG-019	OMC-SG019	SC00796	AVG01269	FCS00057	8-hour	4/20/2012	7:46	-28.0	16:22	-10.5	8:36
Main Building	SG-020	OMC-SG020	SC00292	AVG01192	FCS00075	8-hour	4/20/2012	7:49	-28.9	16:25	-5.8	8:36
	Duplicate of SG-020	OMC-SG024-R	SC00653	AVG01192	FCS00073				-29.1		-3.3	
Main Building	SG-021	OMC-SG021	SC01499	(missing information)		8-hour	4/20/2012	7:44	-29.3	16:13	-2.4	8:29
Main Building	SG-022	OMC-SG022	SC00102	AVG00392	FCS00080	8-hour	4/20/2012	7:42	-28.9	16:06	-5.3	8:24
Main Building	CS-001 (Crawl Space)	OMC-CS001	SC01592	AVG00978	FCS00077	8-hour	4/20/2012	8:21	-29.4	16:56	-6.1	8:35

TABLE 3

Subslab Soil Gas Sample Results Compared to Soil Gas Screening Levels

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

		SGSLs Corresponding to a Target ELCR of 10^{-6} in Indoor Air Assuming an DAF = 0.1 (µg/m³)	SGSLs Corresponding to a Target HI of 0.1 in Indoor Air Assuming an DAF = 0.1 (µg/m³)	SG-001 12CW02-01 4/19/2012	SG-002 12CW02-02 4/19/2012	SG-003 12CW02-03 4/19/2012	SG-004 12CW02-04 4/19/2012	SG-005 12CW02-05 4/19/2012	SG-006 12CW02-06 4/19/2012	SG-007 12CW02-07 4/19/2012	SG-008 12CW02-08 4/19/2012	SG-009 12CW02-09 4/19/2012	SG-010 12CW02-10 4/20/2012	Field Duplicate SG-010 12CW02-23 4/20/2012	SG-011 12CW02-11 4/20/2012	SG-012 12CW02-12 4/20/2012
1,1,1-trichloroethane	µg/m³	-	22,000	4.4	2.7	1,800	6.8	150	46	30	7	6.4	18	15	5.7	41
1,1,2,2-tetrachloroethane	µg/m³	2.1	-	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
1,1,2-trichloroethane	µg/m³	7.7	1	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
1,1-dichloroethane	µg/m³	77	-	2.4 U	1.2 U	9.8 J	3.4 U	1.7 U	4.9 U	38	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
1,1-dichloroethylene	µg/m³	-	880	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.65 J
1,2,4-trichlorobenzene	µg/m³	-	9	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
1,2-dibromoethane	µg/m³	0.2	39	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
1,2-dichlorobenzene	µg/m³	-	880	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
1,2-dichloroethane	µg/m³	4.7	31	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
1,2-dichloropropane	µg/m³	12	18	2.4 U	0.61 J	11 U	3.4 U	1.7 U	4.9 U	2.7 J	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
1,4-dichlorobenzene[2]	µg/m³	11	3,500	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Acetone	µg/m³	-	140,000	8 J	5.8 J	300	51	41	31 J	71 U	68	17	22	66	15	14
Benzene	µg/m³	16	130	2.4 U	1.1 J	11 U	3.4 U	1.7 U	4.9 U	7.1 U	0.65 J	0.45 J	1.5 U	0.47 J	1.1	0.96
Bromodichloromethane	µg/m³	3.3	-	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Bromomethane	µg/m³	-	22	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Carbon disulfide	µg/m³	-	3,100	1.1 J	5.1 J	4 J	13 J	1.8 J	9.2 J	23 J	0.63 J	1.4 J	1.9 J	2.3 J	1.1 J	1.6 J
Carbon tetrachloride	µg/m³	20	440	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
CFC-11	µg/m³	-	3,100	5.7	2	5 J	4.5	1.1 J	3.5 J	15	3.2	1.6	2.3	2	3.3	2.8
CFC-12	µg/m³	-	440	2.9	2.4	11 U	2.8 J	3.7	4.1 J	4.2 J	3.3	2.7	2.7	2.1	4.6	2.7
Chlorobenzene	µg/m³	-	220	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Chlorodibromomethane	µg/m³	4.5	-	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Chloroethane	µg/m³	-	44,000	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Chloroform	µg/m³	5.3	430	2.4 U	1.2 U	8.8 J	3.4 U	1.7 U	4.9 U	8.7	1.1 J	1.4 U	1.5 U	0.32 J	0.74 U	0.75 U
Chloromethane	µg/m³	-	390	2.4 U	0.6 J	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Cis-1,2-dichloroethylene[2]	µg/m³	-	260	2.4 U	1.2 U	24	3.4 U	1.7 U	4.9 U	220	4	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Cis-1,3-dichloropropene[1]	µg/m³	31	88	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Cyclohexane	µg/m³	-	26,000	4.7 U	2.3 U	22 U	6.8 U	3.3 U	9.7 U	14 U	4.5 U	2.9 U	3 U	1.4 U	1.6	2.1
Dichloromethane	µg/m³	260	4,600	0.84 J	0.49 J	5.4 J	1.8 J	1.6 J	2.8 J	3.9 J	1.4 J	0.75 J	0.6 J	0.36 J	0.39 J	0.39 J
Ethylbenzene	µg/m³	49	4,400	0.77 J	1.3	26	4.1	3.9	2.3 J	3.1 J	2.5	6.2	4.3	86	1.7	0.53 J
M,p-xylene	µg/m³	-	440	4.7 U	2.3 J	77	11	12	6.3 J	9.8 J	6.3	17	17 J	350 J	3.3	1.2 J
M-dichlorobenzene	µg/m³	11	3,500	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Methyl ethyl ketone (2-butanone)	µg/m³	-	22,000	8.4 J	1.7 J	9.4 J	5.7 J	6.8 J	3.3 J	71 U	7 J	5.3 J	7 J	82	2.3 J	3.2 J
Methyl isobutyl ketone (4-methyl-2-pentanone)	µg/m³	-	13,000	2.4 U	1.2 U	5.1 J	2.4 J	1.5 J	4.9 U	7.1 U	1.5 J	0.58 J	0.57 J	1.8	0.27 J	0.75 U
Methyl n-butyl ketone	µg/m³	-	130	2.4 U	1.2 U	11 U	1.3 J	3.6	4.9 U	7.1 U	1.3 J	0.96 J	0.92 J	0.55 J	0.42 J	0.53 J
Methylbenzene	µg/m³	-	22,000	0.9 J	1.4	24	5.5	3.3	2.7 J	4.3 J	5.7	5.3	2.6	33	4.4	3
O-xylene	µg/m³	-	440	2.4 U	0.82 J	27	4.3	4.6	2.6 J	8.5	3.2	11	17 J	220 J	2	0.78
Styrene (monomer)	µg/m³	-	4,400	2.4 U	0.38 J	6.7 J	2.3 J	2	3.3 J	7.1 U	1.8 J	3.3	1.8	42	0.63 J	0.27 J
Tert-butyl methyl ether	µg/m³	470	13,000	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Tetrachloroethylene (PCE)	µg/m³	470	180	1.6 J	0.4 J	3.2 J	3.4 U	1.7 U	4.9 U	7.5	3.6	1.3 J	0.55 J	0.58 J	4.5	4.8
Trans-1,2-dichloroethene	µg/m³	-	260	2.4 U	1.2 U	4.1 J	3.4 U	1.7 U	4.9 U	30	1.5 J	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Trans-1,3-dichloropropene[1]	µg/m³	31	88	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Tribromomethane	µg/m³	110	-	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U
Trichloroethylene	µg/m³	30	9	0.85 J	0.69 J	940	3.4 U	1.7 U	4.9 U	10	7.4	1.4 U	1.1 J	1.1	0.26 J	0.22 J
Trichlorotrifluoroethane	µg/m³	-	130,000	13	2	11 U	12	19	3.2 J	7.1 U	2.2 U	1.6	1.4 J	1.5	0.49 J	1.3
Vinyl chloride	µg/m³	28	440	2.4 U	1.2 U	11 U	3.4 U	1.7 U	4.9 U	7.1 U	2.2 U	1.4 U	1.5 U	0.7 U	0.74 U	0.75 U

TABLE 3
Subslab Soil Gas Sample Results Compared to Soil Gas Screening Levels
Larsen Marine Services Facility
Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

		SGSLs Corresponding to a Target ELCR of 10^{-5} in Indoor Air Assuming an DAF = 0.1 (µg/m³)	SGSLs Corresponding to a Target HI of 0.1 in Indoor Air Assuming an DAF = 0.1 (µg/m³)	Field Duplicate SG-012 12CW02-25 4/20/2012	SG-013 12CW02-13 4/20/2012	SG-014 12CW02-14 4/20/2012	SG-015 12CW02-15 4/20/2012	SG-016 12CW02-16 4/20/2012	SG-018 12CW02-18 4/20/2012	SG-019 12CW02-19 4/20/2012	SG-020 12CW02-20 4/20/2012	Field Duplicate SG-020 12CW02-26 4/20/2012	SG-021 12CW02-21 4/20/2012	SG-022 12CW02-22 4/19/2012	CS-001 12CW02-24 4/19/2012
1,1,1-trichloroethane	µg/m³	-	22,000	**41**	**6.8**	**150**	**84**	**12**	**30**	**230**	**170 J**	**340 J**	**260**	**700**	**0.29 J**
1,1,2,2-tetrachloroethane	µg/m³	2.1	-	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
1,1,2-trichloroethane	µg/m³	7.7	1	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
1,1-dichloroethane	µg/m³	77	-	0.75 U	**8.9**	**11**	**8.5**	**0.81 J**	**3.4**	**3.8**	**1.2**	**1.3**	**3.6**	**1.3**	0.81 U
1,1-dichloroethylene	µg/m³	-	880	**0.3 J**	1.4 U	1.7 U	**0.68 J**	0.88 U	0.93 U	**2.1**	**3.3**	**8.2**	**4.4**	**18**	0.81 U
1,2,4-trichlorobenzene	µg/m³	-	9	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
1,2-dibromoethane	µg/m³	0.2	39	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
1,2-dichlorobenzene	µg/m³	-	880	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
1,2-dichloroethane	µg/m³	4.7	31	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
1,2-dichloropropane	µg/m³	12	18	0.75 U	1.4 U	1.7 U	**0.27 J**	0.88 U	0.93 U	0.98 U	**0.88**	**3**	**0.5 J**	**0.29 J**	0.81 U
1,4-dichlorobenzene[a]	µg/m³	11	3,500	0.75 U	1.4 U	1.7 U	0.69 U	**0.96**	**1.4**	**0.57 J**	0.77 U	0.7 U	**3.5**	0.77 U	**6.7**
Acetone	µg/m³	-	140,000	**13**	**140**	**67**	**110**	**240**	**41**	**53**	**7.9**	**7.4**	**270**	**55**	**1300**
Benzene	µg/m³	16	130	**1**	**16**	**0.51 J**	**0.76**	**1.2**	**0.99**	**0.83 J**	0.77 U	**0.42 J**	**1.2**	**6.2**	**3.4**
Bromodichloromethane	µg/m³	3.3	-	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	**2.4**	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
Bromomethane	µg/m³	-	22	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
Carbon disulfide	µg/m³	-	3,100	**1.5 J**	**2.9 J**	**0.77 J**	**2.8 J**	**27**	**4.5 J**	**1.3 J**	**3.9 J**	**8.7**	**4.8 J**	**4.7 J**	8.1 U
Carbon tetrachloride	µg/m³	20	440	0.75 U	1.4 U	**1.2 J**	0.69 U	0.88 U	**0.43 J**	**0.42 J**	**11 J**	**18 J**	**8.1**	**10**	**0.38 J**
CFC-11	µg/m³	-	3,100	**2.5**	**3.1**	**3.1**	**2**	**1.6**	**1.4**	**3**	**6**	**6.4**	**2.2**	**2.9**	**0.97**
CFC-12	µg/m³	-	440	**2.1**	**3.6**	**3.4**	**2**	**2.1**	**2.9**	**2.9**	**2**	**2.1**	**7.3**	**370**	**1.9**
Chlorobenzene	µg/m³	-	220	**0.23 J**	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
Chlorodibromomethane	µg/m³	4.5	-	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
Chloroethane	µg/m³	-	44,000	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
Chloroform	µg/m³	5.3	430	0.75 U	**1.6**	**15**	**21**	**0.68 J**	**8.8**	**4.4**	**20**	**25**	**17**	**22**	**0.33 J**
Chloromethane	µg/m³	-	390	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	**0.69 J**
Cis-1,2-dichloroethylene[b]	µg/m³	-	260	0.75 U	**50**	**900**	**410**	**7.5**	**260**	**22**	**5.8**	**7.3**	**63**	**89**	**2.5**
Cis-1,3-dichloropropene[c]	µg/m³	31	88	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
Cyclohexane	µg/m³	-	26,000	**2.4**	**3.4**	3.3 U	1.4 U	**1 J**	**0.7 J**	2 U	1.5 U	1.4 U	**0.4 J**	**0.44 J**	**1.2 J**
Dichloromethane	µg/m³	260	4,600	**0.34 J**	**9.9**	**14**	**5.9**	**37**	**30**	**6**	**2.6**	**2.2**	**47**	**5.8**	**290**
Ethylbenzene	µg/m³	49	4,400	**0.58 J**	**17**	**1.9**	**2.2**	**8.7**	**22**	**13**	0.77 U	**1.7**	**23**	**7.6**	**46**
M,p-xylene	µg/m³	-	440	**1.4 J**	**150**	**6.9**	**5.6**	**35**	**76**	**42**	1.5 U	**5.3**	**91**	**57**	**180**
M-dichlorobenzene	µg/m³	11	3,500	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
Methyl ethyl ketone (2-butanone)	µg/m³	-	22,000	**3.1 J**	**4.4 J**	**5.2 J**	**4.8 J**	**13**	**3.8 J**	**2.4 J**	**0.62 J**	**1.3 J**	**15**	**5.7 J**	**64**
Methyl isobutyl ketone (4-methyl-2-pentanone)	µg/m³	-	13,000	0.75 U	1.4 U	**0.55 J**	**0.4 J**	**3.6**	**0.41 J**	**0.39 J**	0.77 U	0.7 U	**1.8**	**2**	**4.3**
Methyl n-butyl ketone	µg/m³	-	130	0.75 U	1.4 U	**0.99 J**	**1.2**	**3**	**0.42 J**	**0.71 J**	0.77 U	**0.32 J**	**0.67 J**	0.77 U	0.81 U
Methylbenzene	µg/m³	-	22,000	**3.5**	**210**	**3.3**	**4.7**	**12**	**6.9**	**5**	0.77 U	**3**	**31**	**100**	**100**
O-xylene	µg/m³	-	440	**0.91**	**33**	**2.5**	**2.3**	**18**	**22**	**13**	0.77 U	**2.1**	**31**	**18**	**63**
Styrene (Monomer)	µg/m³	-	4,400	**0.31 J**	**2.5**	**1 J**	**3.2**	**1.1**	**1.8**	**1.2**	0.77 U	**0.46 J**	**14**	**1.3**	**72**
Tert-butyl methyl ether	µg/m³	470	13,000	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	**0.33 J**	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
Tetrachloroethylene (PCE)	µg/m³	470	180	**5.6**	**4.6**	**5.7**	**400**	**300**	**100**	**23**	**0.28 J**	**14**	**34**	**6.2**	**86**
Trans-1,2-dichloroethene	µg/m³	-	260	0.75 U	**4.3**	**120**	**41**	**3.5**	**24**	**4.9**	**2.5**	**2.9**	**13**	**18**	0.81 U
Trans-1,3-dichloropropene[d]	µg/m³	31	88	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
Tribromomethane	µg/m³	110	-	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U
Trichloroethylene	µg/m³	30	9	**0.23 J**	**2.9**	**17**	**90**	**140**	**89**	**63**	**22 J**	**87 J**	**330**	**77**	**0.73 J**
Trichlorotrifluoroethane	µg/m³	-	130,000	**1.4**	**0.56 J**	**1.6 J**	**0.62 J**	**0.67 J**	**0.57 J**	**0.6 J**	**0.36 J**	**0.46 J**	**0.62 J**	**0.72 J**	**0.51 J**
Vinyl chloride	µg/m³	28	440	0.75 U	1.4 U	1.7 U	0.69 U	0.88 U	0.93 U	0.98 U	0.77 U	0.7 U	0.7 U	0.77 U	0.81 U

Note:

Soil gas screening levels were calculated in accordance with the USEPA Region 5 (2010) Vapor Intrusion Guidebook and the methods used by the USEPA (2012) Vapor Intrusion Screening Level Calculator Version 2.0, which uses the USEPA (May 2012) Regional Screening Levels for air.

Detected concentrations are **bolded**

Concentrations exceeding SGSLs based on the target ELCR criteria are indicated with a box

Concentrations exceeding SGSLs based on the target HI criteria are shaded

[a] A regional screening level (RSL) is not available for 1,3-dichlorobenzene; the RSL for 1,4-dichlorobenzene was considered an evaluation surrogate for 1,3-dichlorobenzene.

[b] An RSL is not available for cis-1,2-dichloroethene; the RSL for trans-1,2-dichloroethene was considered an evaluation surrogate for cis-1,2-dichloroethene.

[c] An RSL is not available for cis-1,3-dichloropropene; the RSL for 1,3-dichloropropene was considered an evaluation surrogate for cis-1,3-dichloropropene.

[d] An RSL is not available for trans-1,3-dichloropropene; the RSL for 1,3-dichloropropene was considered an evaluation surrogate for trans-1,3-dichloropropene.

Definitions:

DAF = default soil gas to indoor air attenuation factor
ELCR = excess lifetime cancer risk
HI = hazard index
µg/m3 = micrograms per cubic meter
SGSL = soil gas screening level
U = compound not detected
J = estimated value

TABLE 4

Crawl Space Air Sample Results Compared to Crawl Space Air Screening Levels

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

		CSSLs Corresponding to a Target ELCR of 10-5 in Indoor Air Assuming an DAF = 1 (µg/m³)	CSSLs Corresponding to a Target HI of 1 in Indoor Air Assuming an DAF = 1 (µg/m³)	CS-001 12CW02-24 4/19/2012
1,1,1-trichloroethane	µg/m³	-	22,000	**0.29 J**
1,1,2,2-tetrachloroethane	µg/m³	2.1	-	0.81 U
1,1,2-trichloroethane	µg/m³	7.7	1	0.81 U
1,1-dichloroethane	µg/m³	77	-	0.81 U
1,1-dichloroethylene	µg/m³	-	880	0.81 U
1,2,4-trichlorobenzene	µg/m³	-	9	0.81 U
1,2-dibromoethane	µg/m³	0.2	39	0.81 U
1,2-dichlorobenzene	µg/m³	-	880	0.81 U
1,2-dichloroethane	µg/m³	4.7	31	0.81 U
1,2-dichloropropane	µg/m³	12	18	0.81 U
1,4-dichlorobenzene[a]	µg/m³	11	3,500	**6.7**
Acetone	µg/m³	-	140,000	**1300**
Benzene	µg/m³	16	130	**3.4**
Bromodichloromethane	µg/m³	3.3	-	0.81 U
Bromomethane	µg/m³	-	22	0.81 U
Carbon disulfide	µg/m³	-	3,100	8.1 U
Carbon tetrachloride	µg/m³	20	440	**0.38 J**
CFC-11	µg/m³	-	3,100	**0.97**
CFC-12	µg/m³	-	440	**1.9**
Chlorobenzene	µg/m³	-	220	0.81 U
Chlorodibromomethane	µg/m³	4.5	-	0.81 U
Chloroethane	µg/m³	-	44,000	0.81 U
Chloroform	µg/m³	5.3	430	**0.33 J**
Chloromethane	µg/m³	-	390	**0.69 J**
Cis-1,2-dichloroethylene	µg/m³	-	260	**2.5**
Cis-1,3-dichloropropene	µg/m³	31	88	0.81 U
Cyclohexane	µg/m³	-	26,000	**1.2 J**
Dichloromethane	µg/m³	260	4,600	**290**
Ethylbenzene	µg/m³	49	4,400	**46**
M,p-xylene	µg/m³	-	440	**180**
M-dichlorobenzene	µg/m³	11	3,500	0.81 U
Methyl ethyl ketone (2-butanone)	µg/m³	-	22,000	**64**
Methyl isobutyl ketone (4-methyl-2-pentanone)	µg/m³	-	13,000	**4.3**
Methyl n-butyl ketone	µg/m³	-	130	0.81 U
Methylbenzene	µg/m³	-	22,000	**100**
O-xylene	µg/m³	-	440	**63**
Styrene (monomer)	µg/m³	-	4,400	**72**
Tert-butyl methyl ether	µg/m³	470	13,000	0.81 U
Tetrachloroethylene (PCE)	µg/m³	470	180	**86**

TABLE 4

Crawl Space Air Sample Results Compared to Crawl Space Air Screening Levels

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

		CSSLs Corresponding to a Target ELCR of 10-5 in Indoor Air Assuming an DAF = 1 (µg/m³)	CSSLs Corresponding to a Target HI of 1 in Indoor Air Assuming an DAF = 1 (µg/m³)	CS-001 12CW02-24 4/19/2012
Trans-1,2-dichloroethene[b]	µg/m³	-	260	0.81 U
Trans-1,3-dichloropropene[c,d]	µg/m³	31	88	0.81 U
Tribromomethane	µg/m³	110	-	0.81 U
Trichloroethylene	µg/m³	30	9	**0.73 J**
Trichlorotrifluoroethane	µg/m³	-	130,000	**0.51 J**
Vinyl chloride	µg/m³	28	440	0.81 U

Note:

Crawl space air screening levels were calculated in accordance with the USEPA Region 5 (2010) Vapor Ir
Guidebook and the methods used by USEPA (2012) Vapor Intrusion Screening Level Calculator Version 2
which uses the USEPA (May 2012) Regional Screening Levels for air.

Detected concentrations are **bolded**

Concentrations exceeding CSSLs based on the target ELCR criteria are indicated with a box

Concentrations exceeding CSSLs based on the target HI criteria are shaded

[a] A regional screening level (RSL) is not available for 1,3-dichlorobenzene; the RSL for 1,4-dichlorobenzene was considered an evaluation surrogate for 1,3-dichlorobenzene.

[b] An RSL is not available for cis-1,2-dichloroethene; the RSL for trans-1,2-dichloroethene was considered an evaluation surrogate for cis-1,2-dichloroethene.

[c] An RSL is not available for cis-1,3-dichloropropene; the RSL for 1,3-dichloropropene was considered an evaluation surrogate for cis-1,3-dichloropropene.

[d] An RSL is not available for trans-1,3-dichloropropene; the RSL for 1,3-dichloropropene was considered an evaluation surrogate for trans-1,3-dichloropropene.

Definitions:

CSSL = crawl space air screening level

DAF = default crawl space air to indoor air attenuation factor

ELCR = excess lifetime cancer risk

HI = hazard index

µg/m³ = micrograms per cubic meter

U = compound not detected

J = estimated value

Figures

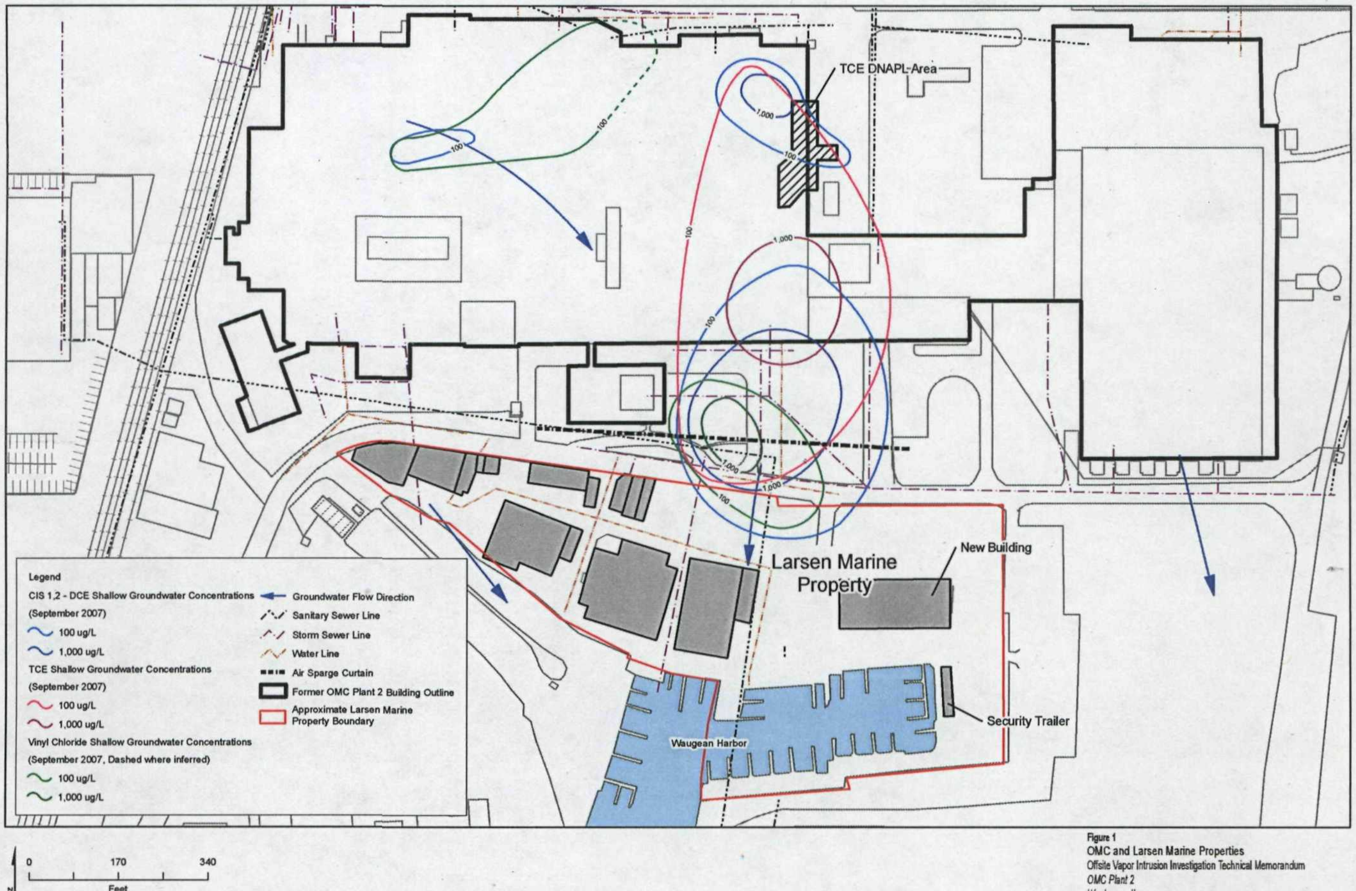

Figure 1
OMC and Larsen Marine Properties
Offsite Vapor Intrusion Investigation Technical Memorandum
OMC Plant 2
Waukegan, IL

CH2MHILL

E:\EPA\186305-OMC\GIS_DATA\MXDS\2012\VAPORINTRUSIONTECHMEMO\FIGURE 01 - OFFSITE VAPOR INTRUSION.MXD JHANSEN1 9/26/2012 5:35:42 PM

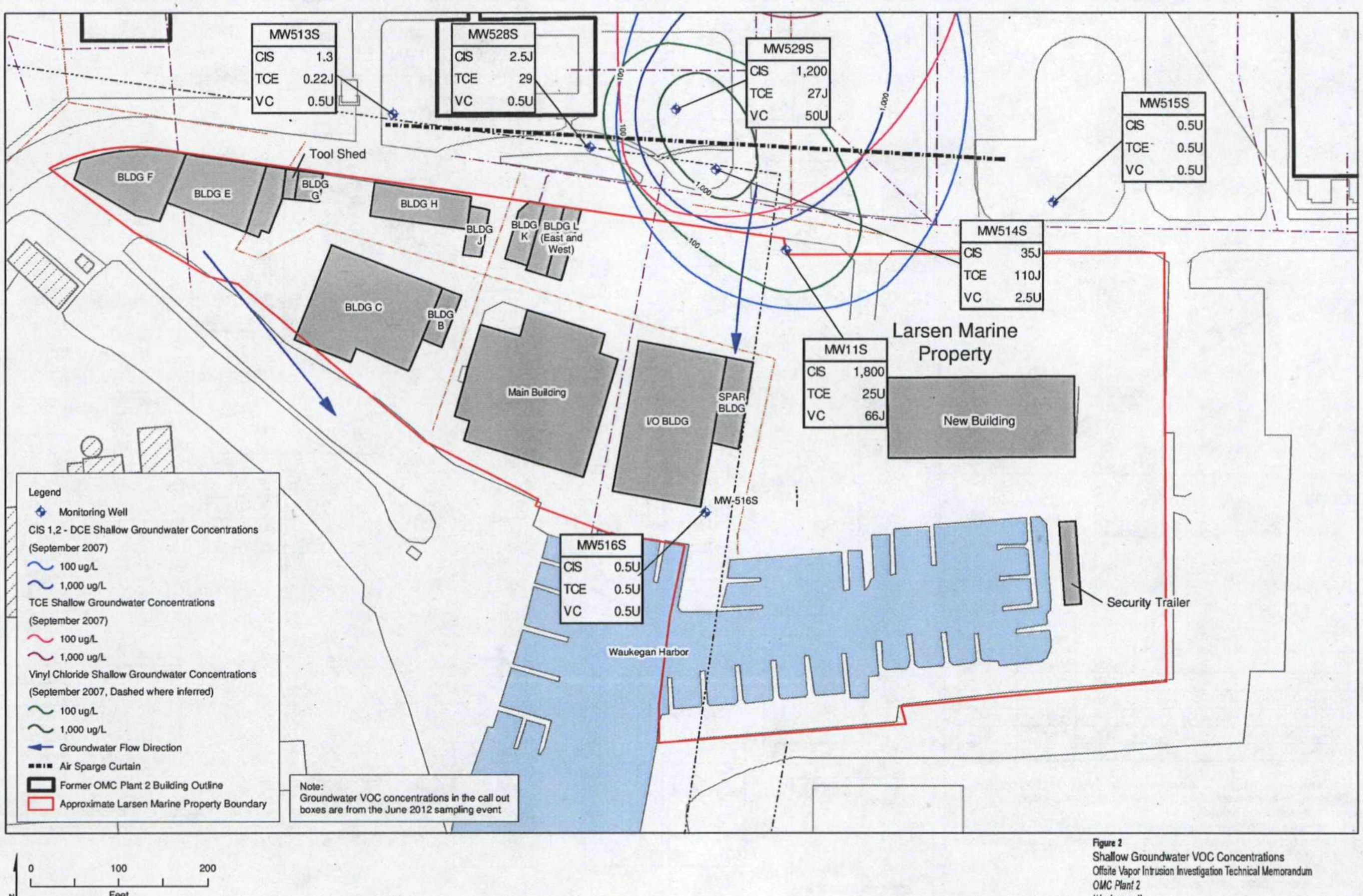

Figure 2
Shallow Groundwater VOC Concentrations
Offsite Vapor Intrusion Investigation Technical Memorandum
OMC Plant 2
Waukegan, IL

E:\EPA\186305 OMC\GIS_DATA\MXDS\2012\VAPORINTRUSIONTECHMEMO\FIGURE 02 - SHALLOW GROUNDWATER VOC CONCENTRATIONS.MXD JHANSEN1 9/27/2012 8:24:27 AM

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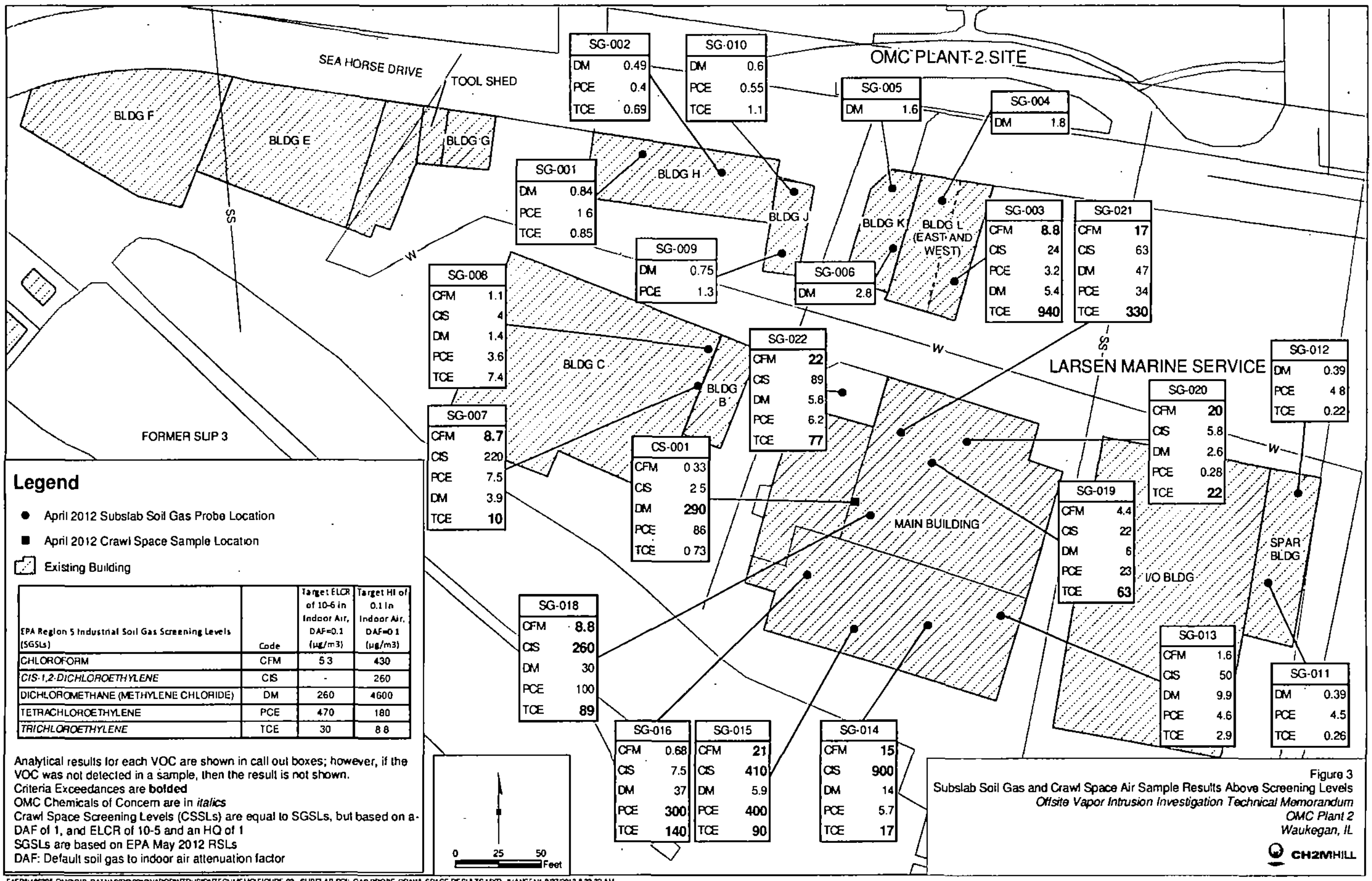


Legend

- ● April 2012 Subslab Soil Gas Probe Location
- ■ April 2012 Crawl Space Sample Location
- Existing Building

EPA Region 5 Industrial Soil Gas Screening Levels (SGSLs)	Code	Target ELCR of 10-6 in Indoor Air, DAF=0.1 (µg/m3)	Target HI of 0.1 in Indoor Air, DAF=0.1 (µg/m3)
CHLOROFORM	CFM	5.3	430
CIS-1,2-DICHLOROETHYLENE	CIS	-	260
DICHLOROMETHANE (METHYLENE CHLORIDE)	DM	260	4600
TETRACHLOROETHYLENE	PCE	470	180
TRICHLOROETHYLENE	TCE	30	8.8

Analytical results for each VOC are shown in call out boxes; however, if the VOC was not detected in a sample, then the result is not shown.
Criteria Exceedances are **bolded**
OMC Chemicals of Concern are in *italics*
Crawl Space Screening Levels (CSSLs) are equal to SGSLs, but based on a DAF of 1, and ELCR of 10-5 and an HQ of 1
SGSLs are based on EPA May 2012 RSLs
DAF: Default soil gas to indoor air attenuation factor

Figure 3
Subslab Soil Gas and Crawl Space Air Sample Results Above Screening Levels
Offsite Vapor Intrusion Investigation Technical Memorandum
OMC Plant 2
Waukegan, IL

CH2MHILL

E:\EPA\186305 OMC\GIS_DATA\MXDS\2012\VAPORINTRUSIONTECHMEMO\FIGURE 03 - SUBSLAB SOIL GAS PROBE CRAWL SPACE RESULTS.MXD JHANSEN1 8/27/2012 8:23:22 AM

Attachment A

Larsen Building Descriptions

ATTACHMENT A

Larsen Building Descriptions

Building E/F/G

Building E/F/G is a cold boat storage building. Multiple large boats are stored through the winter inside the building. There are no workers who occupy the buildings. Boat owners may spend some time within the building doing light repairs, primarily sanding and painting, in April and May. The building footprint is 16,254 square feet (ft^2). The original portion of the building, Building E, was constructed in the early 1950s. Building F and G were constructed as additions to Building E in the mid- to late 1950s.

Building F is one large cold boat storage area. The walls are constructed of wood boards that were salvaged from demolished buildings; the walls are not insulated. The gable roof is corrugated metal with several glass skylights. There are wooden beams and roof supports in the building. The roof is approximately 20 feet high. The south side of the building comprises four sliding bay doors that extend to the ceiling to allow for boats to be moved into and out of the building. There is approximately 1 inch of space between the bottom of the sliding doors and the ground that allows for noticeable outdoor air exchange. There is one man door at the southeast corner of the building. Building F has a poured concrete on-grade slab. There are no sumps or floor drains in the slab. There are some thin cracks throughout the slab and the expansion joints are unsealed. Building F does not have a heating, ventilation, and air conditioning (HVAC) system.

Building E is primarily one large cold boat storage area, except for the eastern side (approximately one-fifth of the Building E footprint), which is a single boat and mast storage area. The area is separated from the rest of Building E with a corrugated metal wall with a single man door. Building E is separated from Building F by a corrugated metal wall. Building E has a corrugated metal gable roof and corrugated metal walls which are not insulated. Rectangles of the metal are cut out and covered with corrugated plastic to let in light throughout the roof and walls. The roof is approximately 20 feet high. There are wooden beams and roof supports in the building. The south side of the building is comprised of four sliding bay doors that extend to the ceiling to allow for boats to be moved into and out of the building; one of the doors is on the separate eastern portion. There is about 1 inch of space between the bottom of the sliding doors and the ground that allows for noticeable outdoor air exchange. There is one man door at the southeast corner of the building. The majority of Building E has a poured concrete on-grade slab that was installed in the early 1980s. However, the separate eastern area has an asphalt floor. There are no sumps or floor drains in the slab. There are some thin cracks throughout the slab and the expansion joints are unsealed. Building E does not have an HVAC system.

Building G is primarily a cold boat storage area, except for the western side (approximately one-fourth of the Building G footprint), which is a tool shed. The two sides are divided by a wood wall. There is a corrugated metal wall between the tool shed and Building E. Building G has corrugated metal roof and walls that are not insulated. The roof is approximately 15 feet high. The south side of the building comprises two sliding bay doors that extend to the ceiling—one to the tool shed and one to the boat storage area. There is about 1 inch of space between the bottom of the sliding doors and the ground that allows for noticeable outdoor air exchange. There is one man door at the southeast corner of the building. Building G has an asphalt floor. The building does not have an HVAC system.

Building H/J

Building H is a cold boat storage building. Multiple large boats are stored through the winter inside the building. There are no workers who occupy the buildings. Boat owners may spend some time within the building doing light repairs, primarily sanding and painting, in April and May. The building footprint is 4,384 ft^2. The building was constructed in the mid- to late 1950s. The north, east, and west walls are constructed of wood boards and are not insulated. The southern half of the east wall is shared with Building J. There are windows along the top of the walls that do not open. The south wall comprises three sliding bay doors that extend to the ceiling to allow for boats to be moved into and out of the building. The bay doors are corrugated metal; rectangles of the metal are cut out and covered with corrugated plastic to let in light. There is about 1 inch of space between the bottom of the sliding doors and the ground that allows for noticeable outdoor air exchange. There is a man door at the southwest corner of the building and a man door at the southeast side that goes to Building J, which is typically bolted shut. The gable roof is corrugated metal and is about 20 feet high. Building H has a poured concrete on-grade slab that was installed in the early 1980s. There are no sumps or floor drains in the slab. There are some cracks throughout the slab, and the expansion joints are unsealed. Building H does not have an HVAC system.

Building J is a paint building; there is room for one large boat to be painted. Typically, one worker occupies the building 8 hours per day, Monday through Friday, for 6 months during the cold season (October to March), and 4 hours per day, Monday through Friday, for the other 6 months. The building footprint is 1,207 ft^2. The building, including the slab, was constructed in the 1960s. The walls are constructed of wood boards (exterior) that are insulated. The interior walls are plywood. The northern half of the west wall is shared with Building H. There are two windows on each of the east and west walls for light that do not open. The south wall comprises one roll-up metal bay door that extends to the ceiling to allow for boats to be moved into and out of the building. There is a man door at the southeast corner of the building, and a man door at the southwest side that goes to Building H that is typically bolted shut. The doors seals tightly and do not allow for noticeable outdoor air exchange. The flat wood roof is shingled and insulated and is about 20 feet high. Building J has a poured concrete on-grade slab that was constructed with the building in the early 1960s. There is one floor drain in the slab. Multiple utilities come up through the slab in the middle of the east wall. There are some cracks throughout the slab and the expansion joints are unsealed. Building J has a radiant heat system on the ceiling and an exhaust fan on the north side. The painting that takes place within this building is an indoor volatile organic compound (VOC) source.

Building K/L

Building K is leased to a boat time share company. They use the space to fix up their boats, including buffing, waxing, painting, and interior cleaning. Building K was historically used for carpentry work. Workers occupy the building on an as-needed basis. The total Building K/L footprint is 5,455 ft^2; Building K is 2,155 ft^2 (approximately 40 percent of the total building footprint). The building was constructed in the 1960s. The building was narrowed by removing part of the west side to allow for a driveway to the complex to be constructed in the mid-1960s. The north, west, and south walls are constructed of corrugated metal on the exterior; the walls are insulated and finished on the interior with painted wood boards. The east wall is shared with Building L. There are windows along the top of the wall that do not open, but there is no doorway between the buildings. There are windows on the south, west, and north walls for light that do not open. The south wall comprises one sliding corrugated metal bay door that extends to the ceiling to allow for boats to be moved into and out of the building. There is a man door at the southeast corner of the building. The doors seals tightly and do not allow for noticeable outdoor air exchange. The flat wood roof is shingled and insulated and is approximately 20 feet high. Building K has a poured concrete on-grade slab that was constructed with the building in the early 1960s. There are two floor drains in the slab and a large vault for city water pipe access. There are cracks in the slab, including one large crack on the north side, and the expansion joints are unsealed. The slab was cut and repaired between the floor drains on the north side. Building K has a forced air heat system that is used when workers are in the building in the winter. There is also a ceiling fan on the south side. Multiple indoor VOC sources are present within the building, including typical household cleaning products like Lysol and Windex, paints, caulks, and mineral spirits.

Building L is divided into two halves with a north-south wall; two open doorways connect the two halves. Building L East is a grinding shop and Building L West is used for light grinding and spot painting. Typically, one worker occupies the building 8 hours per day, Monday through Friday, for 6 months during the cold season (October to March), and 4 hours per day, Monday through Friday, for the other 6 months. The total Building K/L footprint is 5,455 ft^2; Building L is 3,300 ft^2 (about 60 percent of the total building footprint). The building was constructed in the 1960s. There is a small section in the north end of the east side of Building L that has a second story. The second floor is constructed within the 20-foot roof so that both stories are about 10 feet tall. The north side first floor area is a storage room for shop vacuums and blowers, and the second floor is for fiberglass insulation storage. The north, east, and south walls are constructed of corrugated metal on the exterior. The walls are insulated and finished on the interior with painted wood boards. The east wall is shared with Building K. There are windows along the top of the wall that do not open, but there is no doorway between the buildings. There are windows on the east wall for light that do not open. The south wall of Building L comprises two roll-up metal bay doors, one for each half, that extend to the ceiling to allow for boats to be moved into and out of the building. There are man doors at the southwest and southeast corners of the building. The doors seals tightly and do not allow for noticeable outdoor air exchange. The flat wood roof is shingled and insulated and is about 20 feet high. Building L has a poured concrete on-grade slab that was constructed with the building in the early 1960s. There are four floor drains in the slab, two on each half. There are cracks in the slab and the expansion joints are unsealed; there are two large cracks in the east side and one large unsealed seam on the west side. Each half of Building L has a forced air heat system that is set to 65 degrees Fahrenheit (°F) in the winter. There is an exhaust fan at floor level in the northeast corner. There is also a ceiling fan in the west side of Building L. Multiple indoor VOC sources are present within the building primarily on the west side, including acetone, epoxy resin, hardeners, and fiberglass solvent wash.

Building B/C

Building B is a refinishing shop; there is room for one large boat to be worked on. Typically, two workers occupy the building 8 hours per day, Monday through Friday, for 6 months during the warm season (April to September), and one worker for 4 hours per day, Monday through Friday, for the other 6 months. The building footprint is 1,500 ft^2. The building, including the slab, was constructed in the late 1980s. The north and east walls are constructed of corrugated metal and are not insulated. There are two windows on the north wall for light that do not open. There are rectangles of the metal that are cut out and covered with corrugated plastic to let in light on the east wall. The west wall is constructed of cinderblocks and is shared with Building C. There is no doorway between the buildings. The south wall comprises one roll-up metal bay door that extends to the ceiling to allow for boats to be moved into and out of the building. There are man doors at the southeast and northeast corners of the building. The doors seals tightly and do not allow for noticeable outdoor air exchange. The roof is approximately 20 feet high and is angled down from the west side where it is connected to Building C. Building B has a poured concrete on-grade slab that was constructed with the building in the late 1980s. The slab is in good condition with the exception of a covered pit in the southwest corner. There is a heated floor system in the slab. There is a ventilation system that blows air into the building at ceiling height in the southwest corner. The air compressor for the system in located in the northeast corner of Building C. There is an exhaust fan at floor level in the northeast corner. The painting that takes place within this building is an indoor VOC source.

Building C is a heated boat storage building. Multiple large boats are stored through the winter inside the building. There are no workers that occupy the buildings. Boat owners may spend some time within the building doing light repairs, primarily sanding and painting, in April and May. The building footprint is 14,000 ft^2. The building was constructed in 1968. The exterior walls are constructed of corrugated metal on a steel frame. The walls are insulated and finished on the interior with painted wood boards. There are two roll-up doors in the north wall and one on the east wall that extend to the ceiling to allow for boats to be moved into and out of the building. The northern part of the east wall is constructed of cinderblocks and is shared with Building B; there is no doorway between the buildings. There are no windows in the building. There is a man door on the east wall of the building. The doors seal tightly and do not allow for noticeable outdoor air exchange. The roof is corrugated metal on top of a steel frame and is about 22 feet high with multiple skylights. Building C has a poured concrete on-grade slab that was constructed with the building in 1968. There are no sumps or floor drains in the slab. There are some cracks throughout the slab and the expansion joints are unsealed. There is one large crack that runs north/south in the building that was patched. Building C has multiple ceiling forced air heaters that are set to 55°F in the winter. Multiple indoor VOC sources are used within the building for boat cleaning and minor repairs.

Showroom/Shop Building

The building is divided into four main sections: (1) the northwest side is a retail store for boating supplies and the Larsen offices are in this area; (2) the northeast side is the boat showroom; (3) the southeast side the shop; and

(4) the southwest side is a heated boat storage area. The shop area, southwest side of the building, is divided into two halves: the southern half is a bay for sanding and painting with enough room for one boat at the southwest corner of the building, and the northern half is a shop space with a second floor that contains a carpentry shop and lunch room. There is a large bay door that connects the paint room to the boat storage area to the east, and there are two man doors that connect the paint room to the shop. There are man doors connecting the storage area to the showroom, the showroom to the retail store, and the shop to the retail store. The retail store is open for business year-round at the following times: Monday through Thursday, from 8:00 a.m. to 5:00 p.m., and Saturday from 9:00 a.m. to 5:00 p.m. It is also open during the 6 months of spring/summer on Sunday from 10:00 am to 4pm. There are 4 employees working in the retail store, 7 employees working in the sales offices in the northwest side and the showroom, and 12 employees in the shop area.

The current building footprint is 23,522 ft^2. The original building, which was smaller and was called Building A, was constructed in the 1960s. Renovation/reconstruction was performed in 1988 to create the current building. The majority of the building is constructed of corrugated metal on top of a steel frame, with the exception of the northwest side (retail and office space), which is a two-story wood building with a flat shingled roof. The walls are insulated and finished on the inside with painted wood in most areas. There are windows on the north side of the building into the showroom and retail store. There are also windows on the northern portion of the west wall into the offices. There are two roll-up bay doors on the northeast side into the showroom, one roll-up bay door on the southeast corner to the storage area, and one roll-up bay door on the southwest corner to the shop area. Each of the bay doors extends to the ceiling to allow for boats to be moved into and out of the building. There are man doors on the northwest corner to the retail space, on the northeast side to the showroom, and on the southwest side to the shop area. The doors seal tightly and do not allow for noticeable outdoor air exchange. The building has a poured concrete on-grade slab that was constructed with the building in the 1960s. There is an area in the center of the building that has an elevated floor that lies on top of the slab; the elevated floor occurs in the retail and office space. The floor in the boat storage and shop areas is exposed concrete. The floor in the showroom is epoxy-coated. The floor in the retail store is mostly linoleum tile with wall-to-wall carpeting in the offices; there is also an area of wood flooring on the elevated floor. There is a void space between the elevated floor and the slab. There is a very large crack in the concrete floor of the paint room. A septic tank was removed and filled in at the northwest corner of the paint room. The building is heated primarily by radiant heat. There are baseboards in the paint room and the boat storage area. There is also a ceiling heater in the boat storage area across from the bay door (in the northeast corner of the storage room) that is used as supplemental heat for when the door is opened in the winter. There is an oil tank for the furnace next to it. There is an exhaust fan at floor level in the southeast corner of the paint room. Multiple indoor VOC sources are used within the building primarily in the shop and paint room areas, including two lube oil drums, spent oil drums, paints, and gasoline.

In and Out Building and Spar Building

The In and Out Building (I-O Building) is a cold boat storage building. Multiple large boats are stored through the winter inside the building. There are small- and medium-sized boats stacked on shelves along the east and west walls of the building; there are also large boats stored in the center of the building. There are no workers who occupy the buildings, and boat owners do not work on their boats in the building. The building footprint is 17,000 ft^2. The building was constructed in 1973. The building is steel frame construction with corrugated metal walls that are not insulated. The northern half of the east wall is shared with the Spar Building. The southern wall is a double sliding door that extends to the ceiling to allow for boats to be moved into and out of the building. There are no windows. The roof is corrugated metal with multiple skylights; it is 35 feet high. The I-O Building has a poured concrete on-grade slab that was installed when the building was constructed in 1973. There are no sumps or floor drains in the slab. The expansion joints are unsealed. The building does not have an HVAC system. Multiple indoor VOC sources are present within the building, including two waste oil drums and drums of used oil filters. There is also a gas-powered forklift truck that is used within the building.

The Spar Building is used for mast storage and repair. Several large shelves for mast storage are located within the building and there is a long workbench to accommodate mast repair work on the east wall. There are 3 workers in the building for 3 months of the year, 1 worker for another 3 months, and 2 workers for the remainder of the year.

The workers occupy the building 8 hours per day, Monday through Friday. The building footprint is about 4,000 ft^2. The building was constructed in 1973, and an addition was recently added to the south end of the building. The building is steel frame construction with corrugated metal walls that are insulated. The west wall is shared with the I-O Building. The southern wall is a bay door that extends to the ceiling, and there is a window above the bay door to allow light into the building. There are man doors on the south and north sides. The Spar Building has a poured concrete on-grade slab that was installed when the building was constructed in 1973. There are no sumps or floor drains in the slab. The expansion joints are unsealed. There is a forced air heating system. Polyvinyl chloride tubes extending from the ceiling and equipped with fans were installed to circulate the heat. Multiple indoor VOC sources are used within the building for minor mast repairs.

Attachment B

Vapor Intrusion Data Quality Evaluation

Data Usability Evaluation—April 2012 OMC Plant 2 Site, Waukegan, Illinois WA No. 105-RARA-0528, Contract No. EP-S5-06-01

PREPARED FOR: U.S. Environmental Protection Agency

PREPARED BY: Adrienne Korpela/CH2M HILL

DATE: May 29, 2012

This memorandum presents the results of the data usability evaluation of soil gas and crawl space data from the Outboard Marine Corporation (OMC) Plant 2 Site in Waukegan, Illinois. The samples were collected in April 2012 and analyzed by Columbia Analytical Services, Inc., a part of the ALS Group, located in Simi Valley, California. The analytical results will be used to evaluate whether vapors being generated have the potential to impact indoor air above regulatory screening levels.

Sample Data

A total of 21 soil gas, 1 crawl space, and 3 field duplicate samples were collected and shipped by overnight carrier to the subcontract laboratory for analysis. Samples were analyzed for volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (USEPA) Method TO-15 (USEPA 2008).

As part of the quality assurance (QA) process outlined in the site-specific quality assurance project plan (QAPP; CH2M HILL 2012), quality control (QC) samples were collected in the field to complement the assessment of overall data quality and usability. The QC samples consisted of three field duplicate (FD) samples. Table 1 presents the station locations, sample delivery groups (SDGs), and sample identifications (IDs).

TABLE 1
Sample Summary by Sample ID and Location
OMC Plant 2 Site, Waukegan, Illinois

Station Location	SDG	Sample ID
OMC-SG001	P1201602	12CW02-01
OMC-SG002	P1201602	12CW02-02
OMC-SG003	P1201602	12CW02-03
OMC-SG004	P1201602	12CW02-04
OMC-SG005	P1201602	12CW02-05
OMC-SG006	P1201602	12CW02-06
OMC-SG007	P1201602	12CW02-07
OMC-SG008	P1201602	12CW02-08
OMC-SG009	P1201602	12CW02-09
OMC-SG010	P1201602	12CW02-10
OMC-SG011	P1201602	12CW02-11
OMC-SG012	P1201602	12CW02-12
OMC-SG013	P1201602	12CW02-13
OMC-SG014	P1201602	12CW02-14
OMC-CS001	P1201603	12CW02-24
OMC-SG015	P1201603	12CW02-15
OMC-SG016	P1201603	12CW02-16
OMC-SG018	P1201603	12CW02-18
OMC-SG019	P1201603	12CW02-19
OMC-SG020	P1201603	12CW02-20
OMC-SG021	P1201603	12CW02-21
OMC-SG022	P1201603	12CW02-22
OMC-SG023-R (FD of OMC-SG010)	P1201603	12CW02-23
OMC-SG024-R (FD of OMC-SG020)	P1201603	12CW02-26
OMC-SG025-R (FD of OMC-SG012)	P1201603	12CW02-25

Analytical Data

The data were reviewed to assess their analytical accuracy, precision, and completeness. The review was conducted in accordance with the site-specific QAPP (CH2M HILL, 2012). A forms review was conducted on 100 percent of the definitive data. The forms review consisted of a review of the following QC items:

- Holding times and sample receipt conditions
- Required QC samples at the specified frequencies
- Laboratory control sample (LCS) precision and accuracy
- Blank contamination and, if any, its impact on the analytical results
- Surrogate recovery accuracy
- Instrument tuning criteria
- Initial calibration and continuing calibration precision and accuracy
- Laboratory and field duplicate precision

The QA/QC limits implemented during the data quality evaluation were those listed in the site-specific QAPP.

Standard data qualifiers were added as a means of classifying the data as to their conformance to QA/QC requirements. The data qualifiers are defined as follows:

U Undetected. The analyte was analyzed for but not detected at a concentration equal to or greater than the laboratory reporting limit.

J Estimated. The analyte was below the stated reporting limit, but greater than the method detection limit, or there is an analytical bias.

The analytical results were within project control limits, except where noted in Table 2.

Field Duplicates

Three FD samples were collected and analyzed as required and precision criteria were met with the following exception: when the results for both the native sample and the FD sample were greater than 5 times the reporting limit and the relative percent difference (RPD) between the sample results exceeded 25 percent for soil gas, the sample results not previously qualified, were qualified. The detected sample results were qualified as estimated and flagged "J" in the FD pair.

TABLE 2
Field Duplicate Precision
OMC Plant 2 Site, Waukegan, Illinois

Parameter	Unit	Sample Concentration	Field Duplicate Concentration	RPD
SG010 and SG023-R				
m,p-xylenes	μg/m^3	17 J	350 J	181
o-xylene	μg/m^3	17 J	220 J	171
SG020 and SG024-R				
1,1,1-Trichloroethane	μg/m^3	170 J	340 J	67
Carbon tetrachloride	μg/m^3	11 J	18 J	48
Trichloroethene	μg/m^3	22 J	87 J	119

RPD = relative percent difference, μg/m^3 = microgram per cubic meter

Conclusions

The evaluation of the FD data indicates possible bias due to applicable QC statistics. However, the accuracy and precision were generally acceptable, and the data set completeness was deemed as 100 percent usable and may be used in the project decision making process with qualification.

Overall Assessment

The final activity in the data quality evaluation is an assessment of whether the data meet the data quality objectives. The goal of the assessment was to demonstrate that a sufficient number of representative samples were collected, and the resulting analytical data can be used to support the decision making process. The following summary highlights the data evaluation findings for the above-defined events:

1. The completeness objective of 90 percent was met for all method/analyte combinations.
2. The precision and accuracy of the data, as measured by field and laboratory QC indicators, indicate that the data quality objectives were met.

The data summary tables are attached to the technical memorandum titled "Offsite Vapor Intrusion Investigation for the Outboard Marine Corporation, Inc., Plant 2 Superfund Site."

Reference Cited

CH2M HILL. 2012. *Quality Assurance Project Plan, Revision 1, OMC Plant 2 Site, Waukegan, Illinois.* WA No. 074-RARA-0528 Contract No. EP-S5-06-01. April.

USEPA. 2008. *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review.* June.

Attachment 2
Phase 2 Offsite Vapor Intrusion Investigation
Outboard Marine Corporation Plant 2, Waukegan, Illinois

Phase 2 Offsite Vapor Intrusion Investigation Outboard Marine Corporation Plant 2, Waukegan, Illinois WA No. 105-RARA-0528, Contract No. EP-S5-06-01

PREPARED FOR: Tim Drexler/USEPA

PREPARED BY: Jennifer Simms/CH2M HILL
Dave Shekoski/CH2M HILL

COPIES: Jewelle Keiser/CH2M HILL
Loren Lund/CH2M HILL

DATE: June 28, 2013

Introduction

This memorandum presents the results of the Phase 2 vapor intrusion (VI) investigation conducted as part of the remedial action at Outboard Marine Corporation, Inc., Plant 2, in Waukegan, Illinois (Figure 1). The investigation was conducted on the adjacent Larsen Marine Services property, south of the site. A dissolved-phase chlorinated volatile organic compound (CVOC) groundwater plume extends from the site to the northern part of the Larsen Marine property, which is hydraulically downgradient. An air sparge curtain installed along the southern Plant 2 boundary is being operated to prevent continued offsite migration of the plume. Several buildings on the Larsen Marine property serve the recreational boat industry ranging from storage, maintenance, and sales. The *Phase 1 Offsite Vapor Intrusion Investigation Technical Memorandum* (CH2M HILL 2012) contains site background information and the preliminary conceptual site model for VI.

The Phase 1 VI investigation conducted in 2012 included subslab soil gas and crawlspace air sampling at seven buildings. Two site-related CVOCs (trichloroethene and cis-1,2-dichloroethene) were detected at concentrations above regulatory screening levels in subslab soil gas samples collected from three of the seven buildings. The potential for the VI pathway to cause indoor air levels of site-related CVOCs to exceed regulatory screening levels at these buildings could not be ruled out. The soil gas screening levels used for the VI study are based on a default attenuation factor (AF) of 0.1 in accordance with the U.S. Environmental Protection Agency (USEPA) Region 5 (2010) *VI Guidebook*. USEPA developed this default AF based on VI results from residential buildings. It is not likely to be representative of the large industrial/commercial type buildings on the Larsen Marine property. Therefore, further investigation of the VI pathway was recommended to determine if indoor air concentrations due to VI exceed regulatory target levels and to calculate building-specific attenuation factors (CH2M HILL, 2012).

The objectives of the Phase 2 VI investigation are to confirm the subslab soil gas concentrations measured in Phase 1; to evaluate temporal variability of subslab soil gas VOC concentrations; to calculate building-specific AFs using the tracer gas radon data; and to determine if the VI pathway is complete or significant (i.e., causing indoor air concentrations to exceed regulatory targets).

The Phase 2 VI investigation was performed in accordance with the *Quality Assurance Project Plan Revision 1* (CH2M HILL, 2012) and the following guidance documents:

- USEPA Region 5. 2010. *Vapor Intrusion Guidebook.*
- USEPA Office of Solid Waste and Emergency Response *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (USEPA, 2002). The updated April 2013 public comment version was also considered.
- Interstate Technology and Regulatory Council (ITRC). 2007a. *Vapor Intrusion Pathway: A Practical Guideline.*
- ITRC. 2007b. *ITRC Vapor Intrusion Pathway: Investigative Approaches for Typical Scenarios.*

The vapor intrusion guidance documents were given preference over the State of Illinois EPA Tiered Approach to Corrective Action Objectives because the Plant 2 Site is a USEPA Superfund Site.

Phase 2 Sampling Activities

The Phase 2 VI investigation field event took place from April 8 to 15, 2013. Subslab probe (SG-17) was reinstalled on April 8 and 9; subslab soil gas canister sampling was conducted on April 9 and 10; indoor, outdoor, and crawl space air canister sampling was performed on April 11; and radon sampling was conducted on April 15. At the time, the buildings were occupied and being used. The heating, ventilation, and air conditioning systems were operating at typical settings.

Sampling activities were performed in accordance with the procedures set forth in the *Quality Assurance Project Plan Revision 2* (CH2M HILL 2013). Deviations from those procedures are described below and in the Sampling Methods section. Figure 2 shows the sampling locations. Tables 1 through 3 summarize the sampling activities.

Subslab soil gas and crawl space, indoor, and outdoor air samples were collected in 6-liter Summa canisters over an 8-hour sampling period for VOC analysis by USEPA Method TO-15. Sampling duration was based on the 8-hour work schedule at Larsen Marine. Actual duration varied slightly because of differences in the calibration of the flow controllers received from the laboratory (Table 2). The variance likely did not affect the sampling results, as the conditions within the buildings remained relatively constant throughout the workday.

Subslab soil gas and indoor and outdoor air samples were collected at a subset of the sampling locations over a 5-minute sampling period in 1-liter Tedlar® bags for radon analysis. The radon samples were collected to provide data to calculate empirical subslab soil gas-to-indoor air AFs for each building.

Building surveys were performed during Phase 1. The buildings are described in the *Phase 1 Offsite Vapor Intrusion Investigation Technical Memorandum*. The buildings were observed to be in similar condition during the Phase 2 sampling event, so surveys were not needed.

Weather during the VOC sampling collection period (April 9 through 11) consisted of temperatures ranging from 36 to 44 degrees Fahrenheit. Wind direction was from the north-northeast to the east at 12 to 14 miles per hour. Barometric pressure ranged from 29.68 to 29.98 inches of mercury. Observed conditions included rain each day with periods of fog and thunderstorms. Radon sampling was conducted on April 15. Temperatures were 52 to 58 degrees, wind was from the south to southwest, and barometric pressure was 29.81 inches of mercury with periods of rain. Weather information was obtained from Weather Underground's Website.[1]

Sample Locations

Buildings B/C, L, and the Main Building were sampled during Phase 2 because site-related CVOCs had been detected in them at concentrations above regulatory screening levels in subslab soil gas samples during Phase 1. Subslab soil gas samples were collected from Building C next to the shared wall with Building B because the heated floor system in Building B prevented subslab soil gas sampling.

Subslab soil gas samples were collected from each Phase 1 subslab probe. One subslab probe in the Main Building (SG-17) that had failed the leak check after both attempted installations in Phase 1 was reinstalled in Phase 2. The one crawlspace air sample location in the Main Building was also sampled during Phase 2.

Indoor air samples were collected from eight locations in the Main building so as to provide spatial coverage of the entire building and to target the main separate indoor air compartments within the building. The indoor air sample locations were adjusted in the field to accommodate work activities within the buildings. One indoor air sample was collected at Buildings B and L because each building has only one indoor air compartment and the air is well mixed. The indoor air sampling locations were finalized with Larsen Marine management on April 8. The two outdoor air samples were collected near the three buildings. Figure 2 shows the sampling locations. The locations are plotted on the figure based on hand measurements taken with a tape measure. Table 2 lists the number and type of samples.

[1] http://www.wunderground.com/.

Sampling Methods

Subslab Soil Gas Probe Installation and Sampling. The same methods used for probe installation during Phase 1 were used to reinstall SG-17 in the Main Building during Phase 2. The new probe was placed very close (several inches) to the first probe, so a utility clearance was not necessary. Installation of the subslab soil gas probe consisted of drilling a 1-inch-diameter recess hole in the slab surface (large enough to allow the end nut to be secured with a wrench and deep enough for it to be flush with the floor) and a 0.5-inch-diameter hole through the remainder of the slab. The 0.5-inch hole was drilled at least 3 inches below the bottom of the slab into the subslab bedding material to create a void and to ensure that soil and sand were not pulled into the probe. The hole was drilled using a hammer drill with concrete masonry drill bits. The thickness of the slab and total hole depth were then measured. The subslab probe, consisting of stainless steel Swagelok parts (tubing attached to a probe union with a nut and ferrule) and a brass cap, was assembled and trimmed so that the probe would not extend below the bottom of the slab. The probe was inserted into the hole and sealed with Portland cement. The cement was allowed to harden for at least 24 hours (Table 1).

Each subslab probe was purged and leak checked from April 8 through 10, before sampling. Purging was done by drawing at least 0.5 liter of soil gas from the probe with a vacuum pump at a rate of about 200 milliliters per minute. Leak checking was performed by covering the probe with a vessel filled with helium while drawing soil gas from the probe and into a Tedlar bag. The contents of the bag were then checked for helium with a Dielectric MGD Helium Detector, and if the helium concentration was less than 10 percent of the helium concentration within the vessel the probe passed the leak check. Each of the probes passed the leak test (Table 1). The purged soil gas was also screened with a photoionization detector.

The subslab soil gas samples for VOC analysis were collected on April 9 and 10. The samples were collected in 6-liter SUMMA canisters equipped with flow controllers that were set by the laboratory to collect the sample over an 8-hour period. The initial and final canister pressures were measured with a digital vacuum gauge provided by the laboratory. The initial vacuum had to be greater than -28 inches Hg in order for the canister to be used for sampling. Canisters with less vacuum were returned unused to the laboratory. The canister vacuum during sample collection was observed from dedicated analog gauges. Periodic checks are made to assure that soil gas was actually being drawn into the canister. The canisters were attached to the probes with Teflon tubing and Swagelok nuts. Final canister vacuums between -2 and -5 inches Hg were targeted to collect as much sample volume as possible while still leaving some residual vacuum that the laboratory could confirm upon receipt. When the sampling period was completed the canister valve was closed, the canister was detached from the probe, and the probe cap was replaced. Tables 1 and 2 present the subslab soil gas probe installation and sampling information recorded in the field.

Indoor, Outdoor, and Crawlspace Air Sampling. The indoor, outdoor, and crawlspace air samples for VOC analysis were collected on April 11. The indoor sample canisters were placed on chairs or tables so that the canister inlet was within the breathing zone, roughly 3 to 5 feet above ground. The outdoor canisters were placed on the ground, and lengths of tubing were attached to achieve a sample inlet height within the breathing zone.

One crawlspace air sample was collected for VOC analysis from the void space beneath the raised floor in the retail/office space in the Main Building on April 11. The crawl space was accessed through a metal plate covering an abandoned electric outlet. The plate was removed, and Teflon tubing was extended into the crawl space. The hole was then covered with paper taped to the floor to prevent exchange between the crawlspace and indoor air during sampling. The tubing was attached to a canister with a Swagelok nut for sample collection. When the sampling period was completed, the canister valve was closed, the canister was detached from the tubing, and the metal plate was replaced.

The indoor, outdoor, and crawlspace air samples were collected in a 6-liter Summa canister equipped with flow controllers set by the laboratory to collect the samples over an 8-hour period. The sample procedures were similar to those for subslab soil gas sampling. The initial and final canister vacuums were measured with a digital vacuum gauge, an analog gauge was used to monitor the vacuum during sampling, and the same requirements for initial and final vacuums were used. Table 2 lists the indoor, outdoor, and crawl space air sampling information recorded in the field.

Radon Sampling. The subslab soil gas, and indoor and outdoor air samples from radon analysis, were collected on April 15. The radon samples were collected in 1-liter Tedlar bags equipped with polymer valves. The bags were filled by placing them inside a lung box. A vacuum created in the lung box caused the Tedlar bag to expand and draw the sample inside. A diaphragm pump operating at 200 milliliters per minute was used to provide the vacuum. Table 3 lists the radon sampling information recorded in the field.

Analytical Results

VOC Data

Columbia Analytical Services (CAS) in Simi Valley, California, performed the analyses for VOCs using USEPA Method TO-15. CAS supplied the canisters and flow controllers used for the sample collection. Tables 4 through 8 present the analytical results. The laboratory's full TO-15 target analyte list was reported.

The project chemist performed a data usability evaluation (Attachment A). Duplicate samples were collected at a frequency of 10 percent (1 per 10 samples), and 3 duplicate subslab soil gas samples were collected. *Quality Assurance Project Plan Revision 1* (CH2M HILL, 2012a) describes data quality evaluation procedures that address precision, accuracy, representativeness, completeness, and comparability parameters. The data usability evaluation indicates that the project goals for data precision and accuracy, as measured by field and laboratory quality control indicators, were met, as were analyte and method objectives for completeness (Attachment A).

The initial Summa canister pressures met the quality objectives. Initial pressures were between -28 and -30 inches of mercury, indicating that the canisters had maintained pressure and were not compromised during shipment (Table 2). The final canister pressures were below -10 inches of mercury, except for one that was slightly above (IA-005 at -10.33 inches), indicating that sufficient sample volume was provided to the laboratory to achieve the necessary reporting limits.

Radon Data

The Department of Earth Sciences at the University of Southern California (USC) performed the Radon-222 analyses using USEPA Method Grab Sample/Scintillation Cell Counting. Table 8 lists the analytical results for radon from the subslab soil gas, and indoor and outdoor air samples.

The laboratory performed duplicate analyses on samples SG-03 and SG-21. The reported sample result was the average of the two results. The laboratory corrected the sample results to account for loss of radon through the sample bags. The laboratory determined that the decay rate was 0.18 percent per day based on tests of the samples. The laboratory also adjusted the sample results to account for atmospheric pressure differences between the site and the laboratory.

Data quality validation was not performed on the radon data because they were not used for risk evaluation. However, the precision of the field and laboratory duplicates was checked. There were two field duplicates and two laboratory duplicates. The duplicate sample results were within a control limit of ± 20 percent for the relative percent difference, indicating that the sample matrix did not interfere with the overall analytical process.

Data Evaluation

The following lines of evidence were used to determine if the VI pathway is complete or significant (i.e., causing indoor air concentrations to exceed regulatory targets) in Buildings B/C, L, and the Main Building:

- Comparison of detected VOCs in subslab soil gas, and indoor and crawl space air to regulatory target levels
- Comparison of detected indoor air VOC concentrations to those in subslab soil gas and crawl space air
- Comparison of detected crawl space air VOC concentrations to those in subslab soil gas
- Comparison of detected indoor and crawl space air VOC concentrations to those in outdoor air
- Comparison of detected VOCs in subslab soil gas, and indoor and crawl space air to the known site-related VOCs
- Comparison of subslab soil gas and shallow groundwater VOC concentrations (Figure 3)

- Assessment of spatial patterns of VOC concentrations
- Comparison of Phase 1 and 2 subslab soil gas and crawlspace air detected VOCs to evaluate temporal variability and confirm the Phase 1 results
- Calculation of site-specific AFs using radon data
- Assessment of building characteristics pertinent to the VI pathway
- Evaluation of potential indoor VOC sources

Calculation of the Site-Specific Empirical Attenuation Factors

Empirical subslab-soil-gas-to-indoor-air AFs were calculated for each building by dividing the indoor air concentration of radon by the subslab soil gas concentration of radon. Empirical AFs were calculated to determine subslab-to-indoor attenuation of vapors, which is likely greater than that predicted by the generic AF (Table 9). The empirical AFs (0.001 to 0.002) based on radon data were significantly lower than the generic AF of 0.1, supporting that more attenuation is occurring at these commercial/industrial buildings than predicted by the residential-based generic AF. An empirical AF of 0.002 was used to develop site-specific soil gas screening levels (SGSLs).

Although the measured outdoor air radon concentration (0.03 picocurie/liter) may have contributed to the levels measured indoors, accounting for this potential contribution did not significant affect the site-specific AF of 0.002.

The calculated empirical AFs support the statement made in the *Offsite Vapor Intrusion Investigation Technical Memorandum* (CH2M HILL, 2012) that the default AF of 0.1 from the USEPA Region 5 *Vapor Intrusion Guidebook* (USEPA, 2010) that is based on data collected from residential buildings was likely overestimating actual indoor air concentrations in commercial/industrial-type buildings, such as the Larsen Marine buildings. Building characteristics that likely provide greater attenuation include the large interior compartments, which allow for dilution of subslab soil gases entering the buildings, and thick concrete slabs that are generally in good condition.

Data Comparison to USEPA Risk-based Screening Levels

The USEPA risk-based screening levels for subslab soil gas, and indoor and crawl space air were calculated in accordance with the USEPA Region 5 *Vapor Intrusion Guidebook,* the USEPA (2013a) VI Screening Level Calculator Version 3.1, and USEPA (2013b) regional screening levels for air. Industrial screening levels were used because the buildings on the Larsen Marine property are used for commercial purposes. Screening levels are not available for several VOCs, and so surrogate values were used as appropriate.

Site-specific SGSLs were derived by applying the site-specific AF of 0.002 to the industrial air regional screening levels. The site-specific SGSLs for monitoring (i.e., to determine if ongoing monitoring is necessary when measured indoor air VOC concentrations are below the indoor air screening levels [IASLs] for mitigation) correspond to an excess lifetime cancer risk (ELCR) of 10^{-5} or hazard index (HI) of 1 (USEPA, 2010). Subslab soil gas analytical results were compared with the site-specific SGSLs for monitoring (Table 4).

The crawlspace screening levels (CSSLs) for monitoring (i.e., to determine if ongoing monitoring is necessary when measured indoor air VOC concentrations are below the IASLs for mitigation) correspond to an ELCR of 10^{-5} or HI of 1 in indoor air, assuming the USEPA Region 5 generic default crawlspace-air-to-indoor-air attenuation factor of 1 (USEPA, 2010). Crawlspace air analytical results were compared with the CSSLs for monitoring (Table 5).

Two sets of IASLs were used to evaluate the indoor air data: IASLs for mitigation corresponding to an ELCR of 10^{-5} or HI of 1 in indoor air; and IASLs for high priority/rapid response (i.e., mitigation within a few weeks) corresponding to an ELCR of 10^{-4} or HI of 10 in indoor air. Indoor air analytical results were compared to the IALSs for mitigation (Table 6) and to the IALSs for high priority/rapid response (Table 7).

Temporal Variability and Confirmation of Phase 1 Subslab Soil Gas Results

The Phase 1 and 2 subslab soil gas VOC results were compared for two purposes: to evaluate the temporal variability in subslab soil gas, and to confirm the Phase 1 subslab soil gas results. Table 8 compares the subslab soil gas results for chlorinated VOCs detected in Phases 1 or 2. The table identifies temporal variability greater than

10 times. This magnitude of variability was used during the comparison since it is an estimated magnitude of temporal variability reported by others (Johnson, 2013) and EPA Region 5 (2010) VI Guidebook states that their screening levels account for potential temporal variability of up to 10 times.

The air sparge system has been operating "continuously" since the Phase 1 event was performed in April 2012, with occasional downtime due to maintenance, mechanical issues, and weather. Estimated run time is 75 percent on and 25 percent off. Therefore, significant variability between the Phases 1 and 2 soil gas results were not expected because of changes in operation of the air sparge system.

Temporal variability of CVOCs greater than 10 times was observed only for select VOCs (1,1,1-trichloroethane, 1,1-dichloroethane, and PCE) at one probe at Building L and one at the Main Building (Table 8). Subslab concentrations of 1,1-dichloroethane and PCE were relatively low, and the temporally variability was likely related to air being pushed from indoors into the subslab (i.e., "breathing" of the building) and the corresponding variability in background indoor air concentrations. Temporal variability of 1,1,1-trichloroethane subslab concentrations at Building L cannot be explained since it was the only CVOC with that magnitude (a thousandfold difference) of variability; therefore, it appears to be an outlier. The range of variability for all site-related CVOCs (including the one location with high variability for 1,1,1-trichlorethane) does not change the conclusions for Phase 1 or 2, particularly since subslab or indoor air concentrations due to vapor intrusion were well below regulatory targets. The relatively small amount of subslab temporal variability (< 10 times) indicates Phase 2 results confirmed the observations from Phase 1 (i.e., Phase 1 and 2 subslab results were similar).

Although seasonal variability could not be evaluated because both the Phase 1 and 2 sampling events were performed in April, the sampling was performed during the "heating season," which is most likely to be the worst case for VI because the doors are kept closed and the heating systems are operating (USEPA, 2010). Therefore, seasonal variability is unlikely to change the conclusions of the VI investigation.

Multiple Lines of Evidence Evaluation

Building B/C. Building B is a refinishing shop. It is a one-room rectangular structure of 1,500 ft^2. The building is fairly airtight, but there is a ventilation system used during working hours. Building B is connected to Building C along its west wall. Building C is a heated boat storage building that was not included in the VI investigation because it is unoccupied. However, subslab soil gas samples were collected in Building C along the shared wall, because the heated floor system in Building B prevented subslab soil gas sampling.

No VOCs were measured above the site-specific SGSLs for monitoring during Phase 2 (Table 4). One VOC, 1,4-dichlorobenzene, measured above the site-specific IASL for mitigation (Table 6). However, 1,4-dichlorobenzene was not measured above the laboratory reporting levels in either of the two subslab soil gas samples (Table 4) or either of the two outdoor air samples (Table 6), so its presence in the indoor air sample is likely due to an indoor source. Therefore, the VI pathway is not complete or significant at Building B.

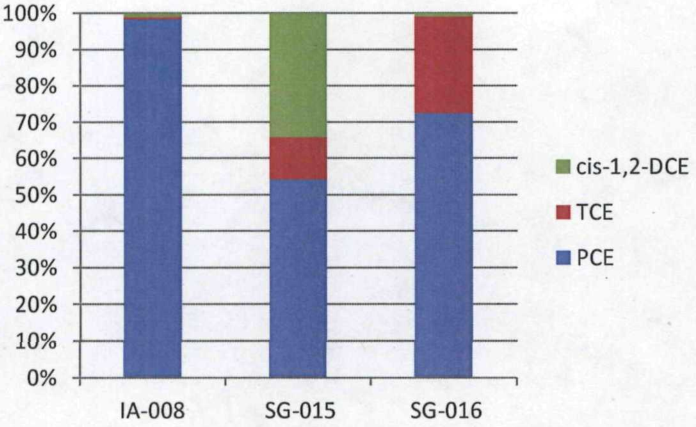
Building L. Building L is a grinding and spot painting shop. The 3,300 ft^2 structure has two rooms that are connected by two open doorways. The building is fairly airtight, but an exhaust fan is used during working hours.

No VOCs were measured above the site-specific SGSLs for monitoring during Phase 2 (Table 4). There was one VOC, ethylbenzene, measured above the site-specific IASL for mitigation (Table 6). However, ethylbenzene was measured at concentrations at least 10 times less in the two subslab soil gas samples (Table 4) and two outdoor air samples (Table 6), and it is found in paint and other indoor sources for this building, so its presence in the indoor air sample is likely due to an indoor source. Therefore, the VI pathway is not complete or significant at Building L.

The Main Building. The Main Building is divided into four main sections: (1) The northwest side is a retail store for boating supplies and the Larsen Marine offices are in this area. (2) The northeast side is a boat showroom. (3) The southeast side is a workshop that also contains a paint shop. (4) The southwest side contains a heated boat resurfacing area, a central tool storage area and an employee lunch room. The building footprint is 23,522 ft^2. The building is fairly airtight, and there are multiple HVAC zones within it that coincide with the four main sections. There is an area in the center of the building that has an elevated floor that lies on top of the slab; this elevated floor occurs in the retail and office space. The crawlspace air sample was collected from that space.

No VOCs were measured above the site-specific SGSLs for monitoring during Phase 2 (Table 4). The VOCs, ethylbenzene, m,p-xylenes, and PCE measured above the site-specific IASLs for mitigation (Table 6). Their presence in indoor air is likely due to indoor sources since (1) the indoor air sample with the highest measured concentrations of these VOCs was in the shop area of the building; (2) ethylbenzene and m,p-xylenes were measured at lower concentrations in the subslab soil gas (Table 4) and outdoor air (Table 6) compared to indoor air indicating an indoor source; (3) ethylbenzene and m,p-xylenes are present in indoor sources such as paint and other petroleum products found in the building; and (4) although PCE was detected in the two nearby subslab soil gas probes (SG-015 and SG-016), the concentration ratios of PCE, TCE, and cis-1,2-DCE in the subslab and indoor samples are very dissimilar, providing strongly suggestive evidence of an indoor source of PCE at IA-008 (Figure 4). Therefore, the VI pathway is not complete or significant at the Main Building.

FIGURE 4
Concentrations Ratios



Conclusions

The VI pathway is not complete or significant at Buildings B, L, or the Main Building based on the multiple lines of evidence evaluation under current site conditions. Further evaluation of the VI pathway is not warranted.

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Tables

TABLE 1

Subslab Soil Gas Probe Installation and Leak Test Log—April 2013

Larsen Marine Services Facility

Outboard Marine Corporation Inc. Plant 2 Superfund Site, Waukegan, Illinois

			Probe Installation			Purge and Leak Check						
Building ID	**Sample Location / ID**	**Location Description**	**Install Date**	**Slab Depth (in.)**	**Probe Depth (in.)**	**Purge Date**	**Purge Start Time**	**Purge Rate (mL/min)**	**Purge Volume (mL)**	**Helium Conc. in Shroud[a]**	**Helium Leak Check (ppm)[b]**	**Total VOCs in Purge Gas (ppm)**
Building C	SG-007	South Probe Along West Wall	4/16/2012	9.5	9	4/9/2013	14:32	200	500	6%	0 (pass)	0
Building C	SG-008	North Probe Along West Wall	4/16/2012	5.5	5	4/9/2013	15:00	200	500	5%	0 (pass)	0
Building L	SG-003	Southeast Side of Building	4/16/2012	7	6.5	4/9/2013	13:58	200	600	5%	0 (pass)	0
Building L	SG-004	Northwest Side of Building	4/16/2012	5	4.5	4/9/2013	14:15	200	600	7%	0 (pass)	0
Main Building	SG-013	Shop Area, East Side	4/17/2012	7.5	7	4/9/2013	16:00	200	600	9%	0 (pass)	0.2
Main Building	SG-014	Shop Area, Center Location	4/17/2012	8	7.5	4/8/2013	15:48	200	600	10%	0 (pass)	0.5
Main Building	SG-015	Boat Painting Area	4/17/2012	7	6.25	4/8/2013	15:35	200	600	8%	0 (pass)	0.3
Main Building	SG-016	Shop Area, Northwest Side	4/17/2012	12	11	4/8/2013	15:20	200	500	8%	0 (pass)	0
Main Building	SG-017[c]	Showroom, South Wall of Showroom	4/9/2013	12	10	4/10/2013	8:50	200	500	6%	0 (pass)	0
Main Building	SG-018	Showroom, Southwest Corner Near Shop Door	4/17/2012	11	10	4/8/2013	15:01	200	500	8%	0 (pass)	0
Main Building	SG-019	Showroom, Northwest Location, Near Office	4/17/2012	11.5	10.5	4/8/2013	13:26	200	600	16%	2125 (pass)	1.2
Main Building	SG-020	Showroom Northeast Location Display Area	4/17/2012	8.5	8	4/8/2013	14:44	200	500	5%	0 (pass)	0
Main Building	SG-021	Office Area	4/17/2012	5	4.5	4/9/2013	13:23	200	500	4%	100 (pass)	0
Main Building	SG-022	Retail Area Under Stairway	4/17/2012	6	5.5	4/9/2013	13:40	200	600	6%	100 (pass)	0

[a] Real-time helium concentration under the shroud during the helium leak test, as measured by an MGD Dielectric helium detector. 1% = 10,000 ppm.

[b] The subslab soil gas probe passes the helium leak check if the detected helium concentration is less than 1,000 parts per million (0.1 percent).

[c] SG-017 which was abandoned in April 2012 due to two failed probes, was re-installed in April 2013 next to the original location.

Definitions:

mL/min = milliliters per minute

ppm = parts per million

VOC = volatile organic compound

TABLE 2

Subslab Soil Gas and Crawl Space Air Sampling Log—April 2013

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

		TO-15 (Summa Canister) Sampling										
Building ID	**Sample Location / ID**	**Sample ID**	**Canister ID**	**Pressure Gauge ID**	**Flow Controller ID**	**Flow Controller Rate**	**Sample Start Date**	**Sample Start Time**	**Initial Pressure—Digital ("Hg)**	**Sample End Time**	**Final Pressure—Digital ("Hg)**	**Sample Duration (HR:MIN)**
Building C	SG-007 (Soil Gas)	OMC-SG007-2	SC00063	AVG02748	FCS00040	8-hour	4/10/2013	8:38	-29.79	16:38	-5.91	8:00
Building C	SG-008 (Soil Gas)	OMC-SG008-2	SC01598	AVG02268	FCS00096	8-hour	4/10/2013	8:40	-29.80	16:40	-7.69	8:00
Building L	SG-003 (Soil Gas)	OMC-SG003-2	SC01738	AVG02918	FCS00006	8-hour	4/10/2013	8:46	-29.83	16:46	-8.67	8:00
Building L	SG-004 (Soil Gas)	OMC-SG004-2	SC00008	AVG02851	FCS00078	8-hour	4/10/2013	8:44	-29.77	16:44	-5.04	8:00
Main Building	SG-013 (Soil Gas)	OMC-SG013-2	SC01700	AVG02377	FCS00110	8-hour	4/9/2013	9:09	-29.91	17:00	-5.57	7:51
Main Building	SG-014 (Soil Gas)	OMC-SG014-2	SC00834	AVG02489	FCS00121	8-hour	4/9/2013	9:07	-29.82	17:02	-8.68	7:55
Main Building	SG-015 (Soil Gas)	OMC-SG015-2	SC00491	AVG02959	FSC00053	8-hour	4/9/2013	9:04	-29.90	17:03	-8.80	7:59
Main Building	SG-016 (Soil Gas)	OMC-SG016-2	SC00220	AVG02886	FCS00118	8-hour	4/9/2013	9:00	29.81	16:34	-6.11	7:34
Main Building	SG-017 (Soil Gas)	OMC-SG017-2	SC00371	AVG02953	FCS00020	8-hour	4/10/2013	9:07	-29.31	16:44	-6.12	7:37
Main Building	SG-018 (Soil Gas)	OMC-SG018-2	SC00862	AVG02755	FCS00126	8-hour	4/9/2013	8:57	-29.61	16:59	-5.96	8:02
Main Building	SG-019 (Soil Gas)	OMC-SG019-2	SC00629	AVG02097	FCS00106	8-hour	4/9/2013	8:52	-29.89	17:04	-5.85	8:12
Main Building	SG-020 (Soil Gas)	OMC-SG020-2	SC01734	AVG02481	FCS00081	8-hour	4/9/2013	8:54	-29.83	17:05	-14.07	8:11
Main Building	SG-021 (Soil Gas)	OMC-SG021-2	SC00326	AVG01914	FCS00097	8-hour	4/10/2013	8:32	-29.85	16:32	-5.00	8:00
Main Building	Duplicate of SG-021	OMC-SG021-2 FD	SC00566	AVG02633	FCS00068	8-hour	4/10/2013	8:32	-29.83	16:32	-7.82	8:00
Main Building	SG-022 (Soil Gas)	OMC-SG022-2	SC00273	AVG02192	FCS00098	8-hour	4/10/2013	8:22	-29.78	16:22	-6.43	8:00
Main Building	Duplicate of SG-022	OMC-SG022-2 FD	SC01554	AVG01741	FCS00124	8-hour	4/10/2013	8:22	-29.82	16:22	-9.67	8:00
Main Building	CS-001 (Crawl Space)	OMC-CS001-2	SC00633	AVG01862	FSC00123	8-hour	4/11/2013	9:09	-29.85	16:48	-7.43	7:39
Main Building	OA-001 (Outdoor Air)	OMC-OA001-2	SC00159	AVG01841	FSC00128	8-hour	4/11/2013	9:06	-29.85	16:45	-5.66	7:39
Main Building	OA-002 (Outdoor Air)	OMC-OA002-2	SC01599	AVG02429	FCS00112	8-hour	4/11/2013	9:01	-29.81	16:54	-6.18	7:53
Building L	IA-001 (Indoor Air)	OMC-IA001-2	SC00405	AVG02966	FCS00025	8-hour	4/11/2013	9:25	-29.75	17:15	-8.53	7:50
Building B	IA-002 (Indoor Air)	OMC-IA002-2	SC00662	AVG02810	FCS00027	8-hour	4/11/2013	9:07	-29.80	16:54	-5.34	7:47
Main Building	IA-003 (Indoor Air)	OMC-IA003-2	SC01042	AVG02355	FCS00046	8-hour	4/11/2013	9:08	-29.79	16:47	-6.83	7:39
Main Building	IA-004 (Indoor Air)	OMC-IA004-2	SC00856	AVG02345	FCS00125	8-hour	4/11/2013	9:09	-29.82	16:49	-8.85	7:40
Main Building	IA-005 (Indoor Air)	OMC-IA005-2	SC01629	AVG02695	FCS00105	8-hour	4/11/2013	9:14	-29.82	16:52	-10.33	7:38
Main Building	IA-006 (Indoor Air)	OMC-IA006-2	SC00702	AVG01651	FCS00067	8-hour	4/11/2013	9:15	-29.76	17:00	-8.92	7:45
Main Building	IA-007 (Indoor Air)	OMC-IA007-2	SC01016	AVG01857	FCS00032	8-hour	4/11/2013	9:11	-29.73	16:50	-6.53	7:39
Main Building	IA-008 (Indoor Air)	OMC-IA008-2	SC01480	AVG01699	FCS00127	8-hour	4/11/2013	9:20	-29.82	16:57	-9.99	7:37
Main Building	IA-009 (Indoor Air)	OMC-IA009-2	SC00796	AVG02686	FCS00104	8-hour	4/11/2013	9:21	-29.90	16:57	-6.18	7:36
Main Building	IA-010 (Indoor Air)	OMC-IA010-2	SC01727	AVG02934	FCS00083	8-hour	4/11/2013	9:22	-29.88	16:58	-7.36	7:36

TABLE 3

Radon Air Sampling Log—April 2013

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

Building ID	Sample Location/ID	Sample ID	Sample Start Date	Sample Time
Building C	SG-007 (Soil Gas)	OMC-SG007-2 Radon	4/15/2013	9:35
Building L	IA-001 (Indoor Air)	OMC-IA001-2 Radon	4/15/2013	9:00
Building L	SG-003 (Soil Gas)	OMC-SG003-2 Radon	4/15/2013	8:55
Building B	IA-002 (Indoor Air)	OMC-IA002-2 Radon	4/15/2013	9:15
Building B	Duplicate of IA-002	OMC-IA-002-2 FD Radon	4/15/2013	9:15
Main Building	IA-003 (Indoor Air)	OMC-IA003-2 Radon	4/15/2013	9:55
Main Building	IA-005 (Indoor Air)	OMC-IA005-2 Radon	4/15/2013	10:30
Main Building	IA-008 (Indoor Air)	OMC-IA008-2 Radon	4/15/2013	11:15
Main Building	IA-009 (Indoor Air)	OMC-IA009-2 Radon	4/15/2013	11:45
Main Building	OA-001 (Outdoor Air)	OMC-OA001-2 Radon	4/15/2013	8:35
Main Building	SG-015 (Soil Gas)	OMC-SG015-2 Radon	4/15/2013	11:25
Main Building	SG-016 (Soil Gas)	OMC-SG016-2 Radon	4/15/2013	11:05
Main Building	SG-018 (Soil Gas)	OMC-SG018-2 Radon	4/15/2013	10:50
Main Building	SG-021 (Soil Gas)	OMC-SG021-2 Radon	4/15/2013	10:15
Main Building	Duplicate of SG-021	OMC-SG-021-2 FD Radon	4/15/2013	10:15

TABLE 4

Subslab Soil Gas Sample Results Compared to Site-Specific Commercial Soil Gas Screening Levels for Monitoring

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

			Building ID	Building L				Building B/C				Main Building																							
			Station Location ID	SG-003-2		SG-004-2		SG-007-2		SG-008-2		SG-013-2		SG-014-2		SG-015-2		SG-016-2		SG-017-2		SG-018-2		SG-019-2		SG-020-2		SG-021-2				SG-022-2			
			Sample Tracking Number	13CL01-14		13CL01-15		13CL01-16		13CL01-17		13CL01-18		13CL01-19		13CL01-20		13CL01-21		13CL01-22		13CL01-23		13CL01-24		13CL01-25		13CL01-26		13CL01-28		13CL01-27		13CL01-29	
			Sample Date	4/10/2013		4/10/2013		4/10/2013		4/10/2013		4/9/2013		4/9/2013		4/9/2013		4/9/2013		4/10/2013		4/9/2013		4/9/2013		4/9/2013		4/10/2013		4/10/2013		4/9/2013		4/9/2013	
			Units	µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³	
		Site-Specific Commercial SGSLs for Monitoring																																	
CAS #	Parameter Name	Corresponding to a Target ELCR of 10^{-5} in Indoor Air Assuming an AF=0.002 (µg/m³)	Corresponding to a Target HI of 1 in Indoor Air Assuming an AF=0.002 (µg/m³)																																
71-55-6	1,1,1-Trichloroethane	—	11,000,000	2,000		8.5		34		4.3		8.4		170		87		13		66		41		270		360		380		370		750		690	
79-34-5	1,1,2,2-Tetrachloroethane	1,100	—	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
79-00-5	1,1,2-Trichloroethane	3,900	440	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
75-34-3	1,1-Dichloroethane	39,000	—	17		0.76	U	31		0.84	U	9.8		12		7.3		2.5	U	8.2		3.5		4.0		1.5	J	4.7		4.7		5.3	U	4.0	U
75-35-4	1,1-Dichloroethene	—	440,000	4.6		0.76	U	0.78	U	0.84	U	0.75	U	0.97		0.32	J	2.5	U	2.2	U	2.2	U	4.4		1.6	J	1.2	J	1.3	J	5.3	U	2.6	J
120-82-1	1,2,4-Trichlorobenzene	—	4,400	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	100	20,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
95-50-1	1,2-Dichlorobenzene	—	440,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
107-06-2	1,2-Dichloroethane	2,400	16,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
78-87-5	1,2-Dichloropropane	6,000	9,000	3.0	U	0.76	U	2.2		0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	0.8	J	2.2	U	0.75	U	2.2	J	2.5	U	2.4	U	5.3	U	4.0	U
106-46-7	1,4-Dichlorobenzene	5,500	1,800,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
67-64-1	Acetone	—	70,000,000	38		82		6.2	J	5.1	J	11		15		7.3	J	150		150		10	J	30		16	J	28		15	J	11	J	24	J
71-43-2	Benzene	8,000	65,000	3.0	U	0.76	U	0.31	J	0.27	J	0.75	U	0.86	U	0.87	U	0.99	J	4.6		0.79	J	0.42	J	2.8	U	0.83	J	0.88	J	5.3	U	4.0	U
75-27-4	Bromodichloromethane	1,700	—	3.0	U	0.76	U	0.73	J	0.84	U	0.75	U	0.32	J	0.87	U	2.5	U	2.2	U	2.1	J	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
74-83-9	Bromomethane (Methyl bromide)	—	11,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
75-15-0	Carbon disulfide	—	1,600,000	30	U	3.1	J	0.76	J	8.4	U	0.49	J	2.5	J	8.7	U	1.5	J	7.6	J	1.0	J	7.8		3.9	J	1.1	J	1.0	J	53	U	1.6	J
56-23-5	Carbon tetrachloride	10,000	220,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	1.9		0.87	U	2.5	U	2.2	U	2.2	U	0.42	J	16		10		10		9.6		8.9	
75-69-4	Trichlorofluoromethane (CFC-11)	—	1,600,000	5.2		5.2		16		2		4.3		3.1		1.8		1.6	J	2.6		2.4		4.1		6.1		3.0		3.0		3.1	J	2.8	J
75-71-8	Dichlorodifluoromethane (CFC-12)	—	220,000	2.4	J	2.2		3.1		2.5		2.7		3.2		10		34		9.7		48		13		4.1		20		21		260		240	
108-90-7	Chlorobenzene	—	110,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
124-48-1	Dibromochloromethane	2,300	—	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
75-00-3	Chloroethane	—	22,000,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.3	J	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
67-66-3	Chloroform (Trichloromethane)	2,700	220,000	12		0.76	U	7.8		0.3	J	2.0		17		23		2.5	U	5.6		8.7		4.8		27		22		22		23		21	
74-87-3	Chloromethane (Methyl chloride)	—	200,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.85		2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
156-59-2	cis-1,2-Dichloroethene[b]	—	130,000	33		0.76	U	190		2.1		53		850		290		5.2		420		310		20		14		69		70		73		68	
10061-01-5	cis-1,3-Dichloropropene[c]	16,000	44,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
110-82-7	Cyclohexane	—	13,000,000	5.9	U	0.55	J	1.6	U	1.7	U	3.7		4.1		3.2		310		2.6	J	4.3	U	1.4	J	5.6	U	3.7	J	3.4	J	11	U	3.4	J
75-09-2	Methylene chloride	6,000,000	1,300,000	1.1	J	0.64	J	0.51	J	0.84	U	0.49	J	0.67	J	0.51	J	6.1		4.1		11		1.0		1.9	J	1.6	J	1.7	J	2.5	J	2.2	J
100-41-4	Ethylbenzene	25,000	2,200,000	3.0	U	1.6		0.45	J	0.84		0.52	J	2.2		1.0		7.3		8.0		2.2	U	0.75	U	2.8	U	1.1	J	1.1	J	5.3	U	4.0	U
179601-23-1	m,p-Xylene	—	220,000	2.2	J	7.0		1.3	J	3.1		1.9		3.5		2.8		28		22		1.4	J	1.5	U	2.2	J	3.9	J	4.0	J	11	U	4.1	J
541-73-1	1,3-Dichlorobenzene[a]	5,500	1,800,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
78-93-3	2-Butanone (Methyl ethyl ketone) (MEK)	—	11,000,000	2.4	J	7.3	J	1.8	J	1.7	J	2.0	J	2.4	J	2.3	J	11	J	30		22	U	2.9	J	28	U	25	U	24	U	53	U	4.8	J
108-10-1	4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	—	6,500,000	3.0	U	0.35	J	1.7		0.84	U	0.75	U	0.86	U	0.38	J	0.98	J	4.6		2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U

TABLE 4

Subslab Soil Gas Sample Results Compared to Site-Specific Commercial Soil Gas Screening Levels for Monitoring

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

CAS #	Parameter Name	Site-Specific Commercial SGSLs for Monitoring: Corresponding to a Target ELCR of 10^{-5} in Indoor Air Assuming an AF=0.002 (µg/m³)	Site-Specific Commercial SGSLs for Monitoring: Corresponding to a Target HI of 1 in Indoor Air Assuming an AF=0.002 (µg/m³)	SG-003-2		SG-004-2		SG-007-2		SG-008-2		SG-013-2		SG-014-2		SG-015-2		SG-016-2	
	Building ID			Building L				Building B/C				Main Building							
	Sample Tracking Number			13CL01-14		13CL01-15		13CL01-16		13CL01-17		13CL01-18		13CL01-19		13CL01-20		13CL01-21	
	Sample Date			4/10/2013		4/10/2013		4/10/2013		4/10/2013		4/9/2013		4/9/2013		4/9/2013		4/9/2013	
	Units			µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³	
591-78-6	2-Hexanone	—	65,000	3.0	U	0.89		0.43	J	0.84	U	0.37	J	0.5	J	0.53	J	2.5	U
108-88-3	Toluene	—	11,000,000	22		51		1.4		4.1		5.0		6.3		3.4		90	
95-47-6	o-Xylene	—	220,000	1.2	J	4.2		0.5	J	1.3		0.84		1.3		1.2		9.0	
100-42-5	Styrene	—	2,200,000	1.8	J	4.7		0.77	J	0.48	J	0.66	J	0.84	J	0.68	J	6.5	
1634-04-4	Methyl tert butyl ether (MTBE)	240,000	6,500,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U
127-18-4	Tetrachloroethene	240,000	90,000	6.1		1.0		9.6		3.3		1.3		6.4		460		380	
156-60-5	trans-1,2-Dichloroethene	—	130,000	6.3		0.76	U	27		0.98		5.3		120		34		3.3	
10061-02-6	trans-1,3-Dichloropropene[d]	16,000	44,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U
75-25-2	Bromoform	55,000	—	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U
79-01-6	Trichloroethene	15,000	4,400	1,500		1.2		11		6.0		3.9		26		100		140	
76-13-1	Trifluorotrichloroethane (Freon 113)	—	65,000,000	2.1	J	8.5		2.2		0.58	J	0.56	J	1.5		0.62	J	2.5	U
75-01-4	Vinyl chloride	14,000	220,000	3.0	U	0.76	U	0.78	U	0.84	U	0.75	U	0.86	U	0.87	U	2.5	U

CAS #	Parameter Name	SG-017-2		SG-018-2		SG-019-2		SG-020-2		SG-021-2		SG-021-2		SG-022-2		SG-022-2	
	Building ID	Main Building															
	Sample Tracking Number	13CL01-22		13CL01-23		13CL01-24		13CL01-25		13CL01-26		13CL01-28		13CL01-27		13CL01-29	
	Sample Date	4/10/2013		4/9/2013		4/9/2013		4/9/2013		4/10/2013		4/10/2013		4/9/2013		4/9/2013	
	Units	µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³	
591-78-6	2-Hexanone	2.7		2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
108-88-3	Toluene	21		2.5		1.4		5.5		4.9		4.7		5.3	U	6.2	
95-47-6	o-Xylene	8.7		2.2	U	0.75	U	2.8	U	1.4	J	1.5	J	5.3	U	1.3	J
100-42-5	Styrene	2.5		0.69	J	0.75	U	1.4	J	2.6		2.9		2.4	J	2.7	J
1634-04-4	Methyl tert butyl ether (MTBE)	2.0	J	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
127-18-4	Tetrachloroethene	17		100		20		16		19		19		4.4	J	6.2	
156-60-5	trans-1,2-Dichloroethene	54		28		5.1		3.4		14		15		15		15	
10061-02-6	trans-1,3-Dichloropropene[d]	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
75-25-2	Bromoform	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
79-01-6	Trichloroethene	29		110		72		97		460		460		76		71	
76-13-1	Trifluorotrichloroethane (Freon 113)	0.84	J	2.2	U	0.66	J	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U
75-01-4	Vinyl chloride	2.2	U	2.2	U	0.75	U	2.8	U	2.5	U	2.4	U	5.3	U	4.0	U

Soil gas screening levels were calculated in accordance with the USEPA Region 5 (2010) Vapor Intrusion Guidebook and the methods used by the USEPA (April 2013) Vapor Intrusion Screening Level Calculator Version 2.0, which uses the USEPA (May 2012) Regional Screening Levels for air.

— = EPA RSL not available

Detected concentrations are bolded

Concentrations exceeding SGSLs based on the target ELCR criteria are indicated with a box

Concentrations exceeding SGSLs based on the target HI criteria are shaded

[a] = An RSL is not available for 1,3-dichlorobenzene; the RSL for 1,4-dichlorobenzene was considered an evaluation surrogate for 1,3-dichlorobenzene.

[b] = An RSL is not available for cis-1,2-dichloroethene, the RSL for trans-1,2-dichloroethene was considered an evaluation surrogate for cis-1,2-dichloroethene

[c] = An RSL is not available for cis-1,3-dichloropropene; the RSL for 1,3-dichloropropene was considered an evaluation surrogate for cis-1,3-dichloropropene.

Definitions:

DAF = default soil gas to indoor air attenuation factor

ELCR = excess lifetime cancer risk

HI = hazard index

µg/m³ = micrograms per cubic meter

SGSL = soil gas screening level

U = compound not detected

J = estimated value

TABLE 5

Crawl Space Air Sample Results Compared to Commercial Crawl Space Air Screening Levels for Monitoring

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

			Building ID	Main Building	
			Station Location ID	CS-001-2	
			Sample Tracking Number	13CL01-01	
			Sample Date	4/11/2013	
			Units	µg/m³	
		Commercial CSSLs for Monitoring			
CAS #	Parameter Name	Corresponding to a Target ELCR of 10^{-5} in Indoor Air Assuming a DAF=1 (µg/m³)	Corresponding to a Target HI of 1 in Indoor Air Assuming a DAF=1 (µg/m³)		
71-55-6	1,1,1-Trichloroethane	—	22,000	2.8	U
79-34-5	1,1,2,2-Tetrachloroethane	2.1	—	2.8	U
79-00-5	1,1,2-Trichloroethane	7.7	0.88	2.8	U
75-34-3	1,1-Dichloroethane	77	—	2.8	U
75-35-4	1,1-Dichloroethene	—	880	2.8	U
120-82-1	1,2,4-Trichlorobenzene	—	8.8	2.8	U
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.2	39	2.8	U
95-50-1	1,2-Dichlorobenzene	—	880	2.8	U
107-06-2	1,2-Dichloroethane	4.7	31	2.8	U
78-87-5	1,2-Dichloropropane	12	18	2.8	U
106-46-7	1,4-Dichlorobenzene	11	3,500	2.8	U
67-64-1	Acetone	—	140,000	**970**	
71-43-2	Benzene	16	130	**4.1**	
75-27-4	Bromodichloromethane	3.3	—	2.8	U
74-83-9	Bromomethane (Methyl bromide)	—	22	2.8	U
75-15-0	Carbon disulfide	—	3,100	**1.2**	J
56-23-5	Carbon tetrachloride	20	440	2.8	U
75-69-4	Trichlorofluoromethane (CFC-11)	—	3,100	**1.5**	J
75-71-8	Dichlorodifluoromethane (CFC-12)	—	440	**30**	
108-90-7	Chlorobenzene	—	220	2.8	U
124-48-1	Dibromochloromethane	4.5	—	2.8	U
75-00-3	Chloroethane	—	44,000	2.8	U
67-66-3	Chloroform (Trichloromethane)	5.3	430	2.8	U
74-87-3	Chloromethane (Methyl chloride)	—	390	**1.3**	J
156-59-2	*cis-1,2-Dichloroethene*[b]	—	260	**0.93**	J
10061-01-5	cis-1,3-Dichloropropene[c]	31	88	2.8	U
110-82-7	Cyclohexane	—	26,000	**330**	
75-09-2	Methylene chloride	12,000	2,600	**29**	
100-41-4	Ethylbenzene	49	4,400	**40**	
179601-23-1	m,p-Xylene	—	440	**120**	
541-73-1	*1,3-Dichlorobenzene*[a]	11	3,500	2.8	U
78-93-3	2-Butanone (Methyl ethyl ketone) (MEK)	—	22,000	**310**	
108-10-1	4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	—	13,000	**6.1**	
591-78-6	2-Hexanone	—	130	2.8	U
108-88-3	Toluene	—	22,000	**350**	
95-47-6	o-Xylene	—	440	**33**	
100-42-5	Styrene	—	4,400	**19**	
1634-04-4	Methyl tert butyl ether (MTBE)	470	13,000	**1.1**	J
127-18-4	Tetrachloroethene	470	180	**94**	

TABLE 5

Crawl Space Air Sample Results Compared to Commercial Crawl Space Air Screening Levels for Monitoring

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

			Building ID	Main Building	
			Station Location ID	CS-001-2	
			Sample Tracking Number	13CL01-01	
			Sample Date	4/11/2013	
			Units	µg/m³	
		Commercial CSSLs for Monitoring			
CAS #	Parameter Name	Corresponding to a Target ELCR of 10^{-5} in Indoor Air Assuming a DAF=1 (µg/m³)	Corresponding to a Target HI of 1 in Indoor Air Assuming a DAF=1 (µg/m³)		
156-60-5	trans-1,2-Dichloroethene	—	260	2.8	U
10061-02-6	trans-1,3-Dichloropropene[d]	31	88	2.8	U
75-25-2	Bromoform	110	—	2.8	U
79-01-6	Trichloroethene	30	8.8	**0.85**	J
76-13-1	Trifluorotrichloroethane (Freon 113)	—	130,000	2.8	U
75-01-4	Vinyl chloride	28	440	2.8	U

Crawl space screening levels were calculated in accordance with the USEPA Region 5 (2010) Vapor Intrusion Guidebook and the methods used by the USEPA (April 2013) Vapor Intrusion Screening Level Calculator
Version 2.0, which uses the USEPA (May 2012) Regional Screening Levels for air.

— = EPA RSL not available

Detected concentrations are **bolded**

All detected concentrations are below CSSLs based on the target ELCR and target HI criteria

[a] = An RSL is not available for 1,3-dichlorobenzene; the RSL for 1,4-dichlorobenzene was considered an evaluation surrogate for 1,3-dichlorobenzene.

[b] = An RSL is not available for cis-1,2-dichloroethene; the RSL for trans-1,2-dichloroethene was considered an evaluation surrogate for cis-1,2-dichloroethene.

[c] = An RSL is not available for cis-1,3-dichloropropene; the RSL for 1,3-dichloropropene was considered an evaluation surrogate for cis-1,3-dichloropropene.

[d] = An RSL is not available for trans-1,3-dichloropropene; the RSL for 1,3-dichloropropene was considered an evaluation surrogate for

Definitions:

DAF = default soil gas to indoor air attenuation factor
ELCR = excess lifetime cancer risk
HI = hazard index
µg/m3 = micrograms per cubic meter
CSSL = crawl space screening level
U = compound not detected

TABLE 6

Indoor Air Sample Results Compared to Commercial Indoor Air Screening Levels for Mitigation

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

			Building ID	L	B/C	Main Building									Outdoor Air	
			Station Location ID	IA-001-2	IA-002-2	IA-003-2	IA-004-2	IA-005-2		IA-006-2	IA-007-2	IA-008-2	IA-009-2	IA-010-2	OA-001-2	OA-002-2
			Sample Tracking Number	13CL01-02	13CL01-03	13CL01-04	13CL01-05	13CL01-06	13CL01-30	13CL01-07	13CL01-08	13CL01-09	13CL01-10	13CL01-11	13CL01-12	13CL01-13
			Sample Date	4/11/2013	4/11/2013	4/11/2013	4/11/2013	4/11/2013	4/11/2013	4/11/2013	4/11/2013	4/11/2013	4/11/2013	4/11/2013	4/11/2013	4/11/2013
			Units	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
		Commercial IASLs for Mitigation														
CAS #	Parameter Name	Corresponding to a Target ELCR of 10^{-5} in Indoor Air (µg/m³)	Corresponding to a Target HI of 1 in Indoor Air (µg/m³)													
71-55-6	1,1,1-Trichloroethane	—	22,000	25 U	22 U	2.0 J	1.8	1.7 J	1.7 J	0.62 J	1.9 J	4.8 U	4.0 U	14 U	1.5 U	0.79 U
79-34-5	1,1,2,2-Tetrachloroethane	2.1	—	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
79-00-5	1,1,2-Trichloroethane	7.7	0.88	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
75-34-3	1,1-Dichloroethane	77	—	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
75-35-4	1,1-Dichloroethene	—	880	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
120-82-1	1,2,4-Trichlorobenzene	—	8.8	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.2	39	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
95-50-1	1,2-Dichlorobenzene	—	880	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
107-06-2	1,2-Dichloroethane	4.7	31	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
78-87-5	1,2-Dichloropropane	12	18	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
106-46-7	1,4-Dichlorobenzene	11	3,500	25 U	19 J	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
67-64-1	Acetone	—	140,000	1,900	640	930	1,500	1,700	2,000	510	2,100	3,100	630	2,000	19	28
71-43-2	Benzene	16	130	25 U	22 U	3.4	2.0	4.4	4.1	5.2	4.1	9.4	2.9 J	5.8 J	0.64 J	1.3
75-27-4	Bromodichloromethane	3.3	—	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
74-83-9	Bromomethane (Methyl bromide)	—	22	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
75-15-0	*Carbon disulfide*	—	*3,100*	*250 U*	*14 J*	*4.5 J*	*7.0 J*	*3.1 J*	*27 U*	*0.31 J*	*27 U*	*1.5 J*	*40 U*	*140 U*	*15 U*	*7.9 U*
56-23-5	Carbon tetrachloride	20	440	25 U	22 U	2.7 U	0.69 J	2.7 U	2.7 U	0.42 J	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.43 J
75-69-4	Trichlorofluoromethane (CFC-11)	—	3,100	25 U	22 U	2.1 J	1.9	2.0 J	2.0 J	3.0	2.0 J	1.9 J	4.0 U	14 U	1.1 J	1.1
75-71-8	Dichlorodifluoromethane (CFC-12)	—	440	25 U	22 U	15	20	25	25	13	25	69	13	23	2.3	2.7
108-90-7	Chlorobenzene	—	220	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
124-48-1	Dibromochloromethane	4.5	—	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
75-00-3	Chloroethane	—	44,000	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
67-66-3	Chloroform (Trichloromethane)	5.3	430	25 U	22 U	2.7 U	0.46 J	2.7 U	2.7 U	0.9 U	1.0 J	4.8 U	4.0 U	14 U	1.5 U	0.79 U
74-87-3	Chloromethane (Methyl chloride)	—	390	25 U	22 U	1.0 J	0.39 J	1.1 J	1.5 J	0.4 J	1.2 J	4.8 U	4.0 U	14 U	1.2 J	0.3 J
156-59-2	cis-1,2-Dichloroethene[b]	—	260	25 U	22 U	2.7 U	0.77 J	1.0 J	1.1 J	1.7	0.9 J	1.9 J	4.0 U	14 U	1.5 U	0.79 U
10061-01-5	cis-1,3-Dichloropropene[c]	31	88	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
110-82-7	Cyclohexane	—	26,000	23 J	44 U	100	150	250	250	130	210	1,100	210	1,400	1.2 J	7.2
75-09-2	Methylene chloride	12,000	2,600	22 J	22 U	14	17	21	21	12	20	37	7.9	22	1.0 J	0.77 J
100-41-4	Ethylbenzene	49	4,400	97	38	57	1.9	24 J	72 J	45	82	150	91	79	0.75 J	1.7
179601-23-1	m,p-Xylene	—	440	430	180	210	2.8	49 J	280 J	170	310	510	340	270	2.2 J	5.7
541-73-1	1,3-Dichlorobenzene[a]	11	3,500	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	0.9 U	2.7 U	4.8 U	4.0 U	14 U	1.5 U	0.79 U
78-93-3	2-Butanone (Methyl ethyl ketone) (MEK)	—	22,000	230 J	50 J	370	310	410	460	260	420	700	850	560	5.3 J	5.6 J
108-10-1	4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	—	13,000	25 U	22 U	19	3.0	16 J	27 J	13	36	16	3.9 J	4.8 J	1.5 U	0.79 U
591-78-6	2-Hexanone	—	130	25 U	22 U	2.7 U	0.9 U	2.7 U	2.7 U	1.6	2.7 U	4.8 U	4.0 U	14 U	0.6 J	0.79 U
108-88-3	Toluene	—	22,000	4,500	93	330	41	340 J	490 J	330	430	940	800	920	5.5	12
95-47-6	*o-Xylene*	—	*440*	*170*	*110*	*65*	*0.67 J*	*11 J*	*85 J*	*54*	*99*	*170*	*110*	*88*	*0.67 J*	*1.9*
100-42-5	Styrene	—	4,400	860	7.0 J	45	0.58 J	17 J	220 J	81	220	150	47	47	0.61 J	1.5

TABLE 6

Indoor Air Sample Results Compared to Commercial Indoor Air Screening Levels for Mitigation

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

			Building ID	L		B/C		Main Building																		Outdoor Air			
			Station Location ID	IA-001-2		IA-002-2		IA-003-2		IA-004-2		IA-005-2				IA-006-2		IA-007-2		IA-008-2		IA-009-2		IA-010-2		OA-001-2		OA-002-2	
			Sample Tracking Number	13CL01-02		13CL01-03		13CL01-04		13CL01-05		13CL01-06		13CL01-30		13CL01-07		13CL01-08		13CL01-09		13CL01-10		13CL01-11		13CL01-12		13CL01-13	
			Sample Date	4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013	
			Units	µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³	
		Commercial IASLs for Mitigation																											
CAS #	Parameter Name	Corresponding to a Target ELCR of 10^{-5} in Indoor Air (µg/m³)	Corresponding to a Target HI of 1 in Indoor Air (µg/m³)																										
1634-04-4	Methyl tert butyl ether (MTBE)	470	13,000	25	U	22	U	2.7	U	**0.61**	J	**0.95**	J	2.7	U	0.9	U	2.7	U	**2.6**	J	4.0	U	14	U	1.5	U	0.79	U
127-18-4	Tetrachloroethene	470	180	25	U	22	U	**52**		**12**		**68**		**72**		**50**		**81**		**180**		**43**		**89**		**0.88**	J	**1.5**	
156-60-5	trans-1,2-Dichloroethene	—	260	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U	1.5	U	0.79	U
10061-02-6	trans-1,3-Dichloropropene[d]	31	88	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U	1.5	U	0.79	U
75-25-2	Bromoform	110	—	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U	1.5	U	0.79	U
79-01-6	Trichloroethene	30	8.8	25	U	22	U	2.7	U	**0.44**	J	**0.87**	J	2.7	U	**0.81**	J	**0.82**	J	**1.5**	J	4.0	U	14	U	1.5	U	0.79	U
76-13-1	Trifluorotrichloroethane (Freon 113)	—	130,000	25	U	22	U	2.7	U	**0.52**	J	2.7	U	2.7	U	**0.57**	J	2.7	U	4.8	U	4.0	U	14	U	1.5	U	**0.57**	J
75-01-4	Vinyl chloride	28	440	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U	1.5	U	0.79	U

Indoor air screening levels were calculated in accordance with the USEPA Region 5 (2010) Vapor Intrusion Guidebook and the methods used by the USEPA (April 2013) Vapor Intrusion Screening Level Calculator

— = EPA RSL not available

Detected concentrations are bolded

Concentrations exceeding IASLs based on the target ELCR criteria are indicated with a box

Concentrations exceeding IASLs based on the target HI criteria are shaded

[a] = An RSL is not available for 1,3-dichlorobenzene; the RSL for 1,4-dichlorobenzene was considered an evaluation surrogate for 1,3-dichlorobenzene.

[b] = An RSL is not available for cis-1,2-dichloroethene; the RSL for trans-1,2-dichloroethene was considered an evaluation surrogate for cis-1,2-dichloroethene.

[c] = An RSL is not available for cis-1,3-dichloropropene; the RSL for 1,3-dichloropropene was considered an evaluation surrogate for cis-1,3-dichloropropene.

[d] = An RSL is not available for trans-1,3-dichloropropene; the RSL for 1,3-dichloropropene was

Definitions:

DAF = default soil gas to indoor air attenuation factor

ELCR = excess lifetime cancer risk

HI = hazard index

µg/m3 = micrograms per cubic meter

IASL = indoor air screening level

U = compound not detected

J = estimated value

TABLE 7

Indoor Air Sample Results Compared to Commercial Indoor Air Screening Levels for High Priority / Rapid Response

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

			Building ID	L		B/C		Main Building																	
			Station Location ID	IA-001-2		IA-002-2		IA-003-2		IA-004-2		IA-005-2				IA-006-2		IA-007-2		IA-008-2		IA-009-2		IA-010-2	
			Sample Tracking Number	13CL01-02		13CL01-03		13CL01-04		13CL01-05		13CL01-06		13CL01-30		13CL01-07		IA-007-2		13CL01-09		IA-009-2		13CL01-11	
			Sample Date	4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013	
			Units	µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³	
		Commercial IASLs for High Priority / Rapid Response																							
CAS #	Parameter Name	Corresponding to a Target ELCR of 10^{-4} in Indoor Air (µg/m³)	Corresponding to a Target HI of 10 in Indoor Air (µg/m³)																						
71-55-6	1,1,1-Trichloroethane	—	220,000	25	U	22	U	2.0	J	1.8		1.7	J	1.7	J	0.62	J	1.9	J	4.8	U	4.0	U	14	U
79-34-5	1,1,2,2-Tetrachloroethane	21	—	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
79-00-5	1,1,2-Trichloroethane	77	8.8	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
75-34-3	1,1-Dichloroethane	770	—	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
75-35-4	1,1-Dichloroethene	—	8,800	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
120-82-1	1,2,4-Trichlorobenzene	—	88	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	2.0	390	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
95-50-1	1,2-Dichlorobenzene	—	8,800	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
107-06-2	1,2-Dichloroethane	47	310	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
78-87-5	1,2-Dichloropropane	120	180	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
106-46-7	1,4-Dichlorobenzene	110	35,000	25	U	19	J	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
67-64-1	Acetone	—	1,400,000	1,900		640		930		1,500		1,700		2,000		510		2,100		3,100		630		2,000	
71-43-2	Benzene	160	1,300	25	U	22	U	3.4		2.0		4.4		4.1		5.2		4.1		9.4		2.9	J	5.8	J
75-27-4	Bromodichloromethane	33	—	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
74-83-9	Bromomethane (Methyl bromide)	—	220	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
75-15-0	Carbon disulfide	—	31,000	250	U	14	J	4.5	J	7.0	J	3.1	J	27	U	0.31	J	27	U	1.5	J	40	U	140	U
56-23-5	Carbon tetrachloride	200	4,400	25	U	22	U	2.7	U	0.69	J	2.7	U	2.7	U	0.42	J	2.7	U	4.8	U	4.0	U	14	U
75-69-4	Trichlorofluoromethane (CFC-11)	—	31,000	25	U	22	U	2.1	J	1.9		2.0	J	2.0	J	3.0		2.0	J	1.9	J	4.0	U	14	U
75-71-8	Dichlorodifluoromethane (CFC-12)	—	4,400	25	U	22	U	15		20		25		25		13		25		69		13		23	
108-90-7	Chlorobenzene	—	2,200	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
124-48-1	Dibromochloromethane	45	—	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
75-00-3	Chloroethane	—	440,000	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
67-66-3	Chloroform (Trichloromethane)	53	4,300	25	U	22	U	2.7	U	0.46	J	2.7	U	2.7	U	0.9	U	1.0	J	4.8	U	4.0	U	14	U
74-87-3	Chloromethane (Methyl chloride)	—	3,900	25	U	22	U	1.0	J	0.39	J	1.1	J	1.5	J	0.4	J	1.2	J	4.8	U	4.0	U	14	U
156-59-2	cis-1,2-Dichloroethene[b]	—	2,600	25	U	22	U	2.7	U	0.77	J	1.0	J	1.1	J	1.7		0.9	J	1.9	J	4.0	U	14	U
10061-01-5	cis-1,3-Dichloropropene[c]	310	880	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
110-82-7	Cyclohexane	—	260,000	23	J	44	U	100		150		250		250		130		210		1,100		210		1,400	
75-09-2	Methylene chloride	120,000	26,000	22	J	22	U	14		17		21		21		12		20		37		7.9		22	
100-41-4	Ethylbenzene	490	44,000	97		38		57		1.9		24	J	72	J	45		82		150		91		79	
179601-23-1	m,p-Xylene	—	4,400	430		180		210		2.8		49	J	280	J	170		310		510		340		270	
541-73-1	1,3-Dichlorobenzene[a]	110	35,000	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4	U	14	U
78-93-3	2-Butanone (Methyl ethyl ketone) (MEK)	—	220,000	230	J	50	J	370		310		410		460		260		420		700		850		560	
108-10-1	4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	—	130,000	25	U	22	U	19		3.0		16	J	27	J	13		36		16		3.9	J	4.8	J
591-78-6	2-Hexanone	—	1,300	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	1.6		2.7	U	4.8	U	4.0	U	14	U
108-88-3	Toluene	—	220,000	4,500		93		330		41		340	J	490	J	330		430		940		800		920	

TABLE 7

Indoor Air Sample Results Compared to Commercial Indoor Air Screening Levels for High Priority / Rapid Response

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

			Building ID	L		B/C		Main Building																	
			Station Location ID	IA-001-2		IA-002-2		IA-003-2		IA-004-2		IA-005-2				IA-006-2		IA-007-2		IA-008-2		IA-009-2		IA-010-2	
			Sample Tracking Number	13CL01-02		13CL01-03		13CL01-04		13CL01-05		13CL01-06		13CL01-30		13CL01-07		IA-007-2		13CL01-09		IA-009-2		13CL01-11	
			Sample Date	4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/11/2013		4/12/2013		4/11/2013	
			Units	μg/m³		μg/m³		μg/m³		μg/m³		μg/m³		μg/m³		μg/m³		μg/m³		μg/m³		μg/m³		μg/m³	
		Commercial IASLs for High Priority / Rapid Response																							
CAS #	Parameter Name	Corresponding to a Target ELCR of 10^{-4} in Indoor Air (μg/m³)	Corresponding to a Target HI of 10 in Indoor Air (μg/m³)																						
95-47-6	o-Xylene	—	4,400	**170**		**110**		**65**		**0.67**	J	**11**	J	**85**	J	**54**		**99**		**170**		**110**		**88**	
100-42-5	Styrene	—	44,000	**860**		**7.0**	J	**45**		**0.58**	J	**17**	J	**220**	J	**81**		**220**		**150**		**47**		**47**	
1634-04-4	Methyl tert butyl ether (MTBE)	4,700	130,000	25	U	22	U	2.7	U	**0.61**	J	**0.95**	J	2.7	U	0.9	U	2.7	U	**2.6**	J	4.0	U	14	U
127-18-4	Tetrachloroethene	4,700	1,800	25	U	22	U	**52**		**12**		**68**		**72**		**50**		**81**		**180**		**43**		**89**	
156-60-5	trans-1,2-Dichloroethene	—	2,600	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
10061-02-6	trans-1,3-Dichloropropene[d]	310	880	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
75-25-2	Bromoform	1100	—	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U
79-01-6	Trichloroethene	300	88	25	U	22	U	2.7	U	**0.44**	J	**0.87**	J	2.7	U	**0.81**	J	**0.82**	J	**1.5**	J	4.0	U	14	U
76-13-1	Trifluorotrichloroethane (Freon 113)	—	1,300,000	25	U	22	U	2.7	U	**0.52**	J	2.7	U	2.7	U	**0.57**	J	2.7	U	4.8	U	4.0	U	14	U
75-01-4	Vinyl chloride	280	4,400	25	U	22	U	2.7	U	0.9	U	2.7	U	2.7	U	0.9	U	2.7	U	4.8	U	4.0	U	14	U

Indoor air screening levels were calculated in accordance with the USEPA Region 5 (2010) Vapor Intrusion Guidebook and the methods used by the USEPA (April 2013) Vapor Intrusion Screening Level Calculator Version 2.0, which uses the USEPA (May 2012) Regional Screening Levels for air.

— = EPA RSL not available

Detected concentrations are bolded

All detected concentrations are below IASLs based on the target ELCR and target HI criteria

[a] = An RSL is not available for 1,3-dichlorobenzene; the RSL for 1,4-dichlorobenzene was considered an evaluation surrogate for 1,3-dichlorobenzene.

[b] = An RSL is not available for cis-1,2-dichloroethene; the RSL for trans-1,2-dichloroethene was considered an evaluation surrogate for cis-1,2-dichloroethene.

[c] = An RSL is not available for cis-1,3-dichloropropene; the RSL for 1,3-dichloropropene was considered an evaluation surrogate for cis-1,3-dichloropropene.

[d] = An RSL is not available for trans-1,3-dichloropropene; the RSL for 1,3-dichloropropene was

Definitions:

DAF = default soil gas to indoor air attenuation factor

ELCR = excess lifetime cancer risk

HI = hazard index

μg/m3 = micrograms per cubic meter

IASL = indoor air screening level

U = compound not detected

J = estimated value

TABLE 8

Comparison of Phase 1 and 2 Subslab Soil Gas Sample Results

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

	Building ID	Building L										Building C									
	Station Location ID	SG-003		SG-003-2		Greater than 10-times variability?	SG-004		SG-004-2		Greater than 10-times variability?	SG-007		SG-007-2		Greater than 10-times variability?	SG-008		SG-008-2		Greater than 10-times variability?
	Sample Tracking Number	12CW02-03		13CL01-14			12CW		15			12CW02-07		13CL01-16			12CW02-08		13CL01-17		
	Sample Date	4/19/2012		4/10/2013					######			4/19/2012		4/10/2013			4/19/2012		4/10/2013		
	Units	µg/m³					µg/m³					µg/m³					µg/m³				
71-55-6	1,1,1-Trichloroethane	1.0		2,000		Yes	6.8		8.5		-	30		34		-	7.0		4.3		-
75-34-3	1,1-Dichloroethane	1.0	J	17		Yes	3.4	U	0.76	U	-	36		31		-	2.2	U	0.84	U	-
75-35-4	1,1-Dichloroethene	11	U	4.6		-	3.4	U	0.76	U	-	7	U	0.78	U	-	2.2	U	0.84	U	-
56-23-5	Carbon tetrachloride	11	U	3.0	U	-	3.4	U	0.76	U	-	7	U	0.78	U	-	2.2	U	0.84	U	-
67-66-3	Chloroform (Trichloromethane)	8.8	J	12		-	3.4	U	0.76	U	-	9		7.8		-	1.1	J	0.3	J	-
156-59-2	cis-1,2-Dichloroethene	24		33		-	3.4	U	0.76	U	-	220		190		-	4.0		2.1		-
127-18-4	Tetrachloroethene	3.2	J	6.1		-	3.4	U	1.0		-	7.5		9.6		-	3.6		3.3		-
156-60-5	trans-1,2-Dichloroethene	4.1	J	6.3		-	3.4	U	0.76	U	-	30		27		-	1.5	J	0.98		-
79-01-6	Trichloroethene	940		1,500		-	3.4	U	1.2		-	10		11		-	7.4		6.0		-

TABLE 8

Comparison of Phase 1 and 2 Subslab Soil Gas Sample Results

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

	Building ID	Main Building																			
	Station Location ID	SG-013		SG-013-2		*Greater than 10-times variability?*	SG-014		SG-014-2		*Greater than 10-times variability?*	SG-015		SG-015-2		*Greater than 10-times variability?*	SG-016		SG-016-2		*Greater than 10-times variability?*
	Sample Tracking Number	12CW02-13		13CL01-18			12CW02-14		13CL01-19			12CW02-15		13CL01-20			12CW02-16		13CL01-21		
	Sample Date	4/20/2012		4/9/2013			4/20/2012		4/9/2013			4/20/2012		4/9/2013			4/20/2012		4/9/2013		
	Units	μg/m³					μg/m³					μg/m³					μg/m³				
71-55-6	1,1,1 Trichloroethane	6.8		8.4		-	150		170		-	84		87		-	12		13		-
75-34-3	1,1-Dichloroethane	8.9		9.8		-	11		12		-	8.5		7.3		-	0.81	J	2.5	U	-
75-35-4	1,1-Dichloroethene	1.4	U	0.75	U	-	1.7	U	0.97		-	0.68	J	0.32	J	-	0.9	U	2.5	U	-
56-23-5	Carbon tetrachloride	1.4	U	0.75	U	-	1.2	J	1.9		-	0.69	U	0.87	U	-	0.9	U	2.5	U	-
67-66-3	Chloroform (Trichloromethane)	1.6		2.0		-	15		17		-	21		23		-	0.68	J	2.5	U	-
156-59-2	cis-1,2-Dichloroethene	50		53		-	900		850		-	410		290		-	7.5		5.2		-
127-18-4	Tetrachloroethene	4.6		1.3		-	5.7		6.4		-	400		460		-	300		380		-
156-60-5	trans-1,2-Dichloroethene	4.3		5.3		-	120		120		-	41		34		-	3.5		3.3		-
79-01-6	Trichloroethene	2.9		3.9		-	17		26		-	90		100		-	140		140		-

TABLE 8

Comparison of Phase 1 and 2 Subslab Soil Gas Sample Results

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

	Building ID	Main Building																			
	Station Location ID	SG-018		SG-018-2		*Greater than 10-times variability?*	SG-019		SG-019 2		*Greater than 10-times variability?*	SG-020		SG-020-2		*Greater than 10-times variability?*	SG-021		SG-021-2		*Greater than 10-times variability?*
	Sample Tracking Number	12CW02-18		13CL01-23			12CW02-19		13CL01-24			12CW02-20		13CL01-25			12CW02-21		13CL01-26		
	Sample Date	4/20/2012		4/9/2013			4/20/2012		4/9/2013			4/20/2012		4/9/2013			4/20/2012		4/10/2013		
	Units	µg/m³					µg/m³					µg/m³					µg/m³				
71-55-6	1,1,1-Trichloroethane	30		41		-	230		270		-	170	J	360		-	260		380		-
75-34-3	1,1-Dichloroethane	3.4		3.5		-	3.8		4.0		-	1.2		1.5	J	-	3.6		4.7		-
75-35-4	1,1-Dichloroethene	0.93	U	2.2	U	-	2.1		4.4		-	3.3		1.6	J	-	4.4		1.2	J	-
56-23-5	Carbon tetrachloride	0.4	J	2.2	U	-	0.42	J	0.42	J	-	11	J	16		-	8.1		10		-
67-66-3	Chloroform (Trichloromethane)	8.8		8.7		-	4.4		4.8		-	20		27		-	17		22		-
156-59-2	cis-1,2-Dichloroethene	260		310		-	22		20		-	5.8		14		-	63		69		-
127-18-4	Tetrachloroethene	100		100		-	23		20		-	0.28	J	16		Yes	34		19		-
156-60-5	trans-1,2-Dichloroethene	24		28		-	4.9		5.1		-	2.5		3.4		-	13		14		-
79-01-6	Trichloroethene	89		110		-	63		72		-	22	J	97		-	330		460		-

TABLE 9

Radon Analytical Data and Empirical Attenuation Factor Calculation

Larsen Marine Services Facility

Outboard Marine Corporation, Inc., Plant 2 Superfund Site, Waukegan, Illinois

Building L

Indoor Air	Rn (pCi/L)
13CL01-02 (OMC-IA-001-2)	0.11

Subslab Soil Gas	Rn (pCi/L)
13CL01-14 (OMC-SG-003-2)	111

Building L empirical attenuation factor	**0.001**

Building B

Indoor Air	Rn (pCi/L)
13CL01-03 (OMC-IA-002-2)	0.12

Subslab Soil Gas	Rn (pCi/L)
13CL01-16 (OMC-SG-007-2)	61

Building B empirical attenuation factor	**0.002**

Main Building

Indoor Air	Rn (pCi/L)
13CL01-04 (OMC-IA-003-2)	0.43
13CL01-06 (OMC-IA-005-2)	0.25
13CL01-09 (OMC-IA-008-2)	0.42
13CL01-10 (OMC-IA-009-2)	0.12

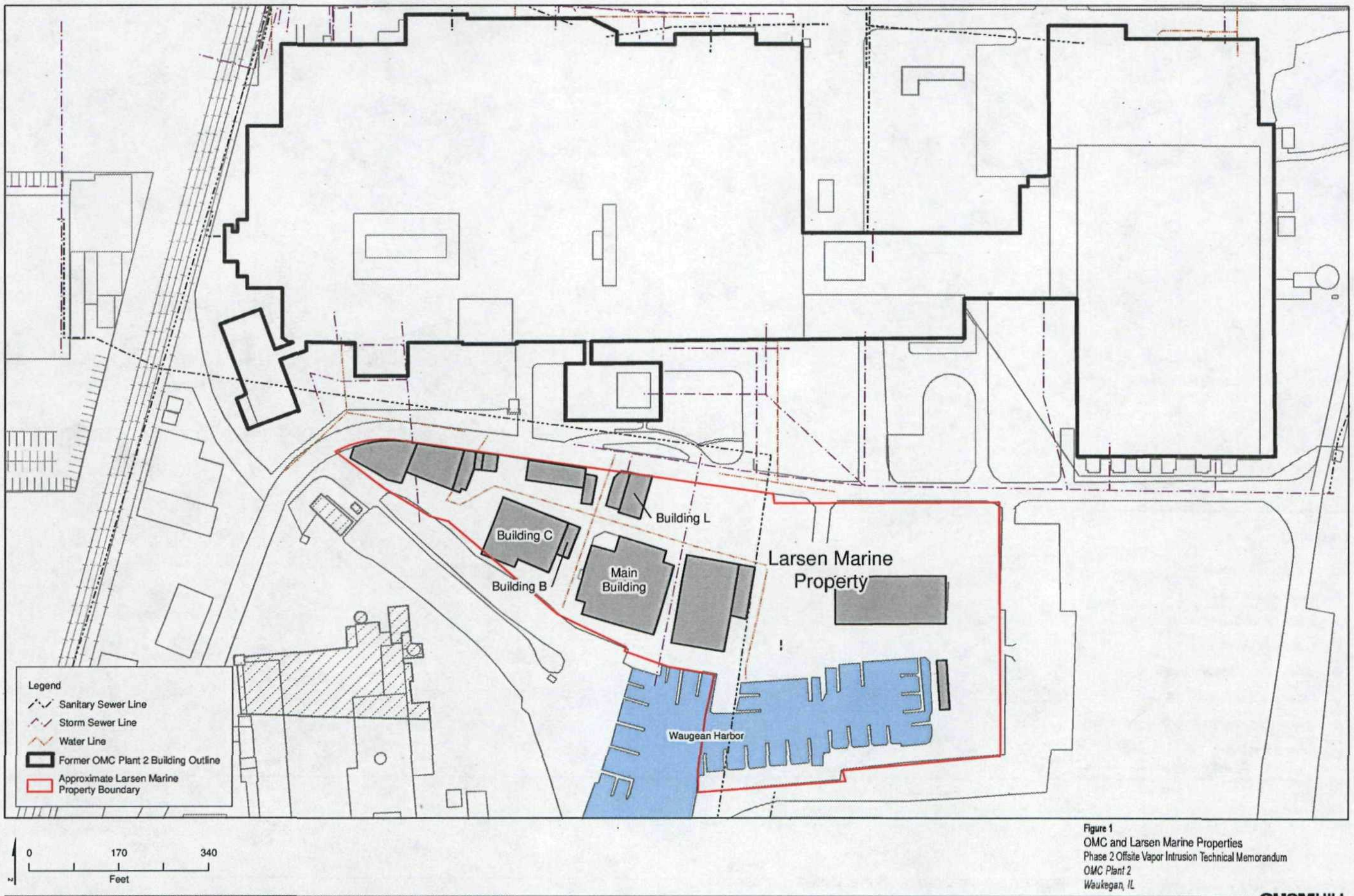
Subslab Soil Gas	Rn (pCi/L)
13CL01-20 (OMC-SG-015-2)	162
13CL01-21 (OMC-SG-016-2)	191
13CL01-23 (OMC-SG-018-2)	90
13CL01-26 (OMC-SG-021-2)	119

Average indoor air Rn concentration	0.31 pCi/L
Average subslab soil gas Rn concentration	141 pCi/L
Main Building empirical attenuation factor	**0.002**

Outdoor Air

	Rn (pCi/L)
13CL01-12 (OMC-OA-001-2)	0.03

Figures



E:\EPA\186305-OMC\GIS_DATA\MXDS\2013\SHEKOSKISIMMS_FIGURES\PHASEII\FIGURE 01 - SITE FIGURE.MXD MPETERSH 6/28/2013 3:24:21 PM

Figure 1
OMC and Larsen Marine Properties
Phase 2 Offsite Vapor Intrusion Technical Memorandum
OMC Plant 2
Waukegan, IL

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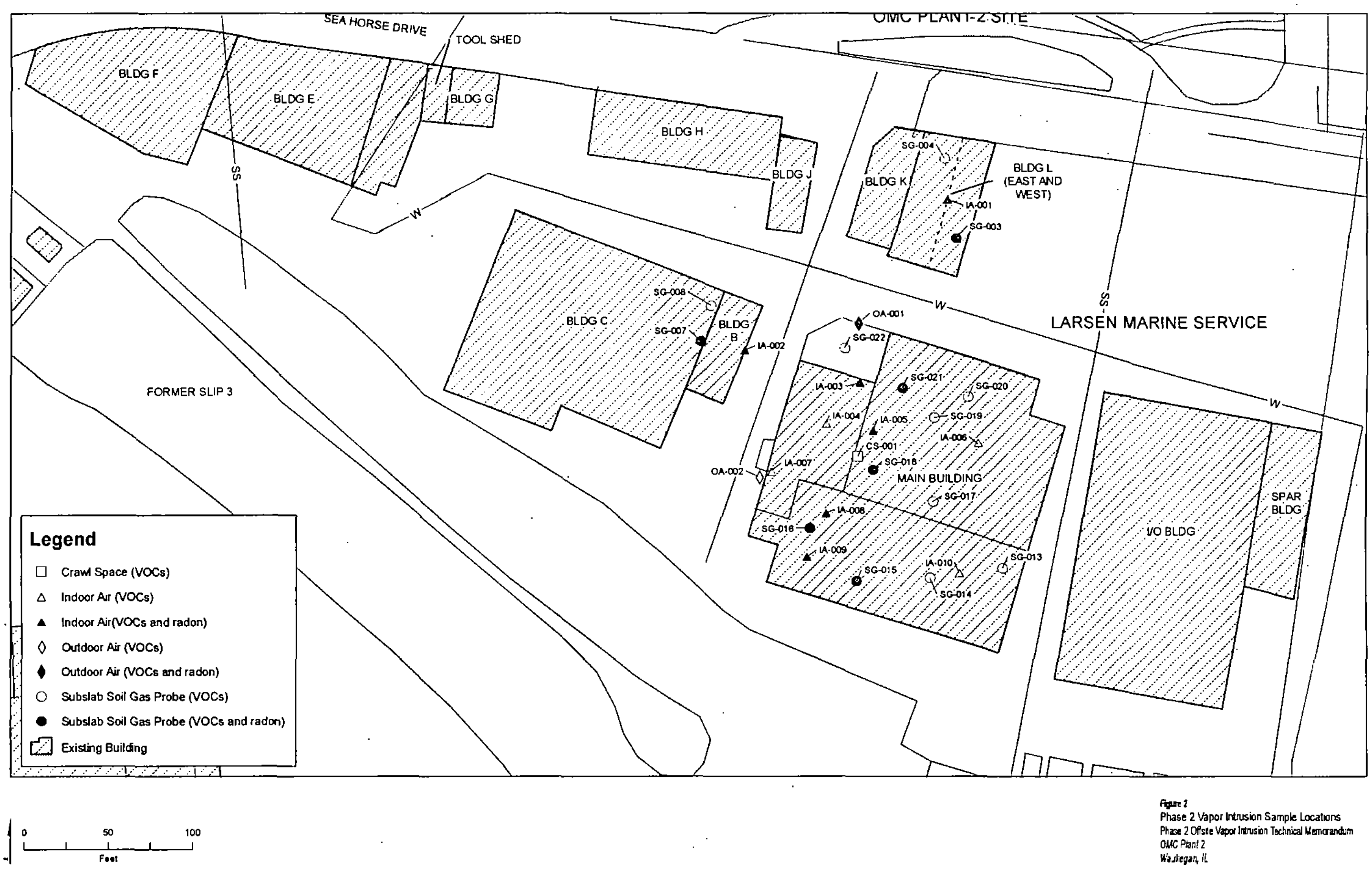

Figure 2
Phase 2 Vapor Intrusion Sample Locations
Phase 2 Offsite Vapor Intrusion Technical Memorandum
OMC Plant 2
Waukegan, IL

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E:\EPA\186005-OMC\GIS_DATA\MXDS\2013\SHEKOSKI\SMMS_FIGURES\PHASE\FIGURE 02 - PHASE 2 VAPOR INTRUSION SAMPLE LOCATIONS.MXD MPETERSH 8/28/2013 3:37:00 PM

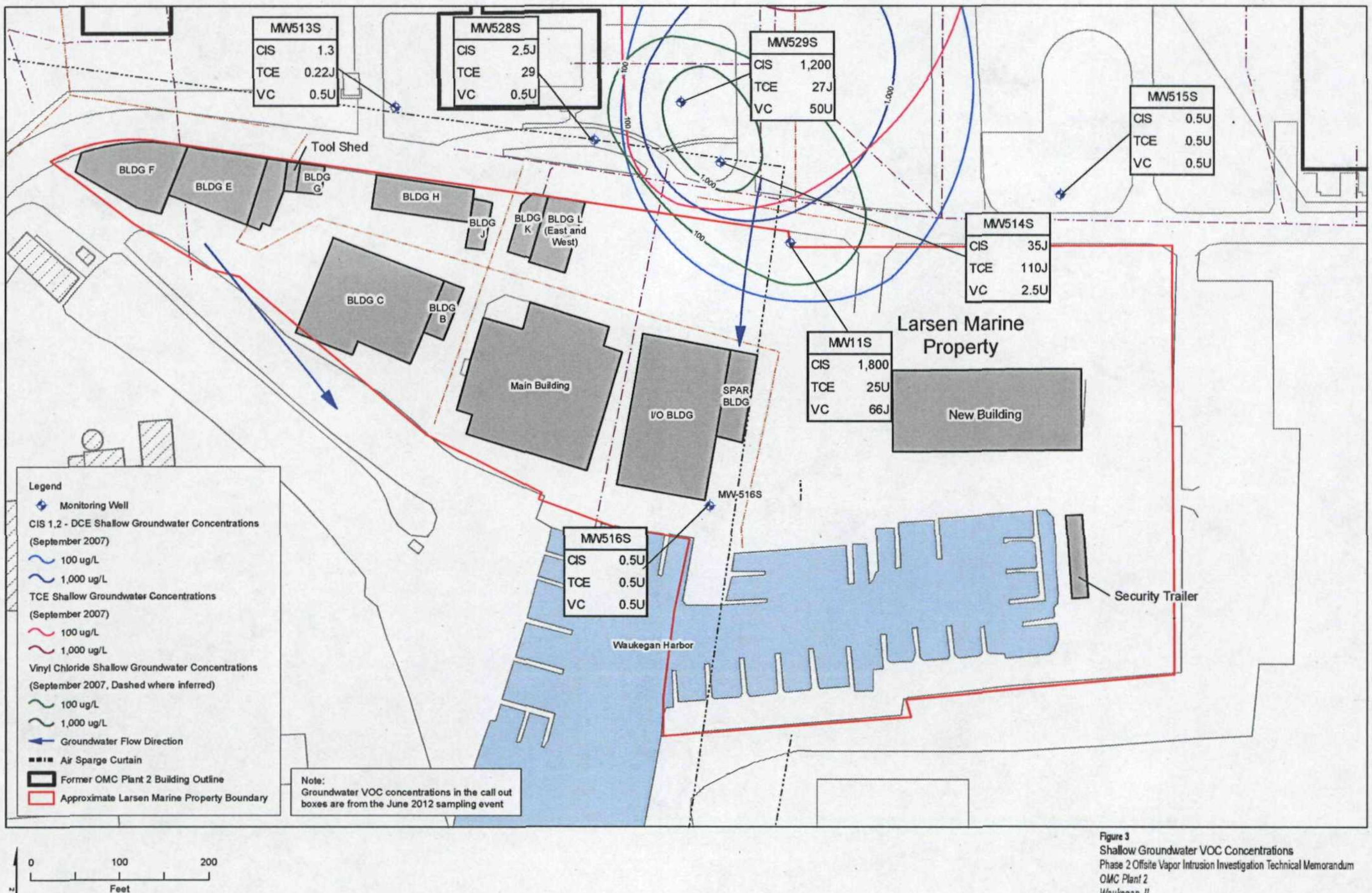

Figure 3
Shallow Groundwater VOC Concentrations
Phase 2 Offsite Vapor Intrusion Investigation Technical Memorandum
OMC Plant 2
Waukegan, IL

E:\EPA\186305-OMC\GIS_DATA\MXDS\2013\SHEKOSKI\SIMMS_FIGURES\PHASEII\FIGURE 03 - SHALLOW GROUNDWATER VOC CONCENTRATIONS.MXD MPETERSH 6/28/2013 3:42:17 PM

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Attachment A

Vapor Intrusion Data Quality Evaluation

Data Usability Evaluation—April 2013 OMC Plant 2 Site, Waukegan, Illinois WA No. 105-RARA-0528, Contract No. EP-S5-06-01

PREPARED FOR: U.S. Environmental Protection Agency

PREPARED BY: Adrienne Korpela/CH2M HILL

DATE: May 10, 2013

This memorandum presents the results of the data usability evaluation of soil gas, crawlspace, indoor, and outdoor air data from the Outboard Marine Corporation (OMC) Plant 2 Site. The samples were collected in April 2013 and analyzed for volatile organic compounds (VOCs) by Columbia Analytical Services, Inc., a part of the ALS Group, located in Simi Valley, California. A subset of the samples was analyzed for radon, a tracer compound, by Doug Hammond at the University of Southern California. The analytical results will be used to evaluate if the VI pathway is complete or significant in occupied buildings where measured subslab soil gas VOC concentrations exceeded screening levels during the initial VI study in 2012.

Sample Data

Fourteen subslab soil gas, one crawlspace, ten indoor air, two outdoor air, and three field duplicate samples were collected and shipped by overnight carrier to the subcontract laboratory for VOC analysis. A subset of those samples (six soil gas, six indoor air, one outdoor, and three field duplicate samples) was analyzed for radon. Samples were analyzed for VOCs by U.S. Environmental Protection Agency (USEPA) Method TO-15 (USEPA 2008), and analyzed for radon by EPA Method Grab Sample/Scintillation Cell Counting.

As part of the quality assurance (QA) process outlined in the site-specific quality assurance project plan (QAPP; CH2M HILL 2013), quality control (QC) samples were collected in the field to complement the assessment of overall data quality and usability. The QC samples consisted of three field duplicate samples. Table 1 lists the station locations, sample delivery groups, and sample identifications.

TABLE 1
Sample Summary by Sample ID and Location
OMC Plant 2 Site, Waukegan, Illinois

Station Location	Sample ID	VOC SDG	Radon SDG
OMC-CS-001-2	13CL01-01	P1301564	—
OMC-IA-001-2	13CL01-02	P1301564	20130416
OMC-IA-002-2	13CL01-03	P1301564	20130416
OMC-IA-002-2 (FD)	13CL01-27	—	20130416
OMC-IA-003-2	13CL01-04	P1301564	20130416
OMC-IA-004-2	13CL01-05	P1301564	—
OMC-IA-005-2	13CL01-06	P1301564	20130416
OMC-IA-005-2 (FD)	13CL01-30	P1301565	—
OMC-IA-006-2	13CL01-07	P1301564	—
OMC-IA-007-2	13CL01-08	P1301564	—
OMC-IA-008-2	13CL01-09	P1301564	20130416
OMC-IA-009-2	13CL01-10	P1301564	20130416
OMC-IA-010-2	13CL01-11	P1301564	—
OMC-OA-001-2	13CL01-12	P1301572	20130416
OMC-OA-002-2	13CL01-13	P1301564	—
OMC-SG-003-2	13CL01-14	P1301564	20130416
OMC-SG-004-2	13CL01-15	P1301564	—
OMC-SG-007-2	13CL01-16	P1301564	20130416
OMC-SG-008-2	13CL01-17	P1301564	—
OMC-SG-013-2	13CL01-18	P1301564	—
OMC-SG-014-2	13CL01-19	P1301564	—
OMC-SG-015-2	13CL01-20	P1301564	20130416
OMC-SG-016-2	13CL01-21	P1301565	20130416
OMC-SG-017-2	13CL01-22	P1301565	—
OMC-SG-018-2	13CL01-23	P1301565	20130416
OMC-SG-019-2	13CL01-24	P1301565	—
OMC-SG-020-2	13CL01-25	P1301565	—
OMC-SG-021-2	13CL01-26	P1301565	20130416
OMC-SG-021-2 (FD)	13CL01-28	P1301565	20130416
OMC-SG-022-2	13CL01-27	P1301565	—
OMC-SG-022-2 (FD)	13CL01-29	P1301565	—

Analytical Data

The data were reviewed to assess their analytical accuracy, precision, and completeness. The review was conducted in accordance with the site-specific QAPP. A forms review was conducted on 100 percent of the definitive data. The forms review consisted of a review of the following QC items:

- Holding times and sample receipt conditions
- Required QC samples at the specified frequencies
- Laboratory control sample (LCS) precision and accuracy
- Blank contamination and, if any, its impact on the analytical results
- Surrogate recovery accuracy
- Instrument tuning criteria
- Initial calibration and continuing calibration precision and accuracy
- Laboratory and field duplicate precision

The QA/QC limits implemented during the data quality evaluation were those listed in the site-specific QAPP.

Standard data qualifiers were added as a means of classifying the data as to their conformance to QA/QC requirements. The data qualifiers are defined as follows:

U Undetected. The analyte was analyzed for but not detected at a concentration equal to or greater than the laboratory reporting limit.

J Estimated. The analyte was below the stated reporting limit, but greater than the method detection limit, or there is an analytical bias.

The analytical results were within project control limits, except as noted in Table 2.

Field Duplicates

Three field duplicate samples were collected and analyzed as required and precision criteria were met with the following exception: when the results for both the native sample and the field duplicate sample were greater than 5 times the reporting limit and the relative percent difference between the sample results exceeded 25 percent for soil gas or air, the sample results not previously qualified, were qualified. The detected sample results were qualified as estimated and flagged "J" in the field duplicate pair.

TABLE 2
Field Duplicate Precision
OMC Plant 2 Site, Waukegan, Illinois

Parameter	Sample Concentration	Field Duplicate Concentration	Relative % Difference
OMC-IA-005-2 (13CL01-06 and 13CL01-30)			
4-Methyl-2-pentanone	16 J	27 J	51
Toluene	340 J	490 J	36
Ethylenzene	24 J	72 J	100
m,p-xylenes	49 J	280 J	140
Styrene	17 J	220 J	171
o-xylene	11 J	85 J	154

All measurements in micrograms per cubic meter.

Conclusions

The evaluation of the field duplicate data indicates possible bias due to applicable QC statistics. However, the accuracy and precision were generally acceptable, and the data set completeness was deemed as 100 percent usable and may be used in the project decision making process with qualification.

Overall Assessment

The final activity in the data quality evaluation is an assessment of whether the data meet the data quality objectives. The goal of the assessment was to demonstrate that a sufficient number of representative samples were collected, and the resulting analytical data can be used to support the decision making process. The following summary highlights the data evaluation findings for the above-defined events:

- The completeness objective of 90 percent was met for all method/analyte combinations.
- The precision and accuracy of the data, as measured by field and laboratory QC indicators, indicate that the data quality objectives were met.

The data summary tables are attached to the Phase 2 Vapor Intrusion Investigation memorandum.

Reference Cited

CH2M HILL. 2013. *Quality Assurance Project Plan, Revision 2, OMC Plant 2 Site, Waukegan, Illinois.* WA No. 074-RARA-0528 Contract No. EP-S5-06-01. April.

USEPA. 2008. *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*. June.